SUPPLEMENTARY NOTES ON THE AMERICAN SPECIES OF ERYTHRINA. III.

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Contents

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Introduction

My monograph on this group of plants appeared in print in October 1939 (1) and the last supplementary notes were published in November 1943 (5).

Abundant new collections, as well as old collections which had not been seen by me previously but have become available since then, are cited in this paper. These extend our knowledge of certain species previously known from incomplete material. Extensions of ranges are noted for many species; one, E. elenae, which was described as new since 1943, is reviewed; one new species, E. oliviae, is described; and three, E. occidentalis, E. panamensis and E. colombiana, are now placed in synonymy.

No need has arisen to arrange the species in a new order or to rewrite the keys. Since the monograph appeared, only three new species have been described, and three reduced to synonymy. For a list of these, see Appendix I.

Since 1941 I have examined and annotated specimens in 58 herbaria. It is, therefore, safe to assume that few collections of American species of Erythrina have escaped my attention. The exception is Museum d'Histoire Naturelle, Paris which it was not possible to visit in 1968.

Distribution of species has been compiled from 3042 collections examined and cited in my papers on the genus (See Appendix XII). Particular effort has been made to make the records as complete as possible. Instead of borrowing specimens I visited many herbaria in person and examined all the available material. It often happens that not all available specimens are sent on loans and these can be more surely located and examined on the spot. Knowledge of the geographical ranges of species is not only of intrinsic importance but often is of great help in identification.

The data on the chromosome number of various species of Erythrina are probably fairly complete. The records were well searched.

New species of Erythrina are to be expected in the species-group Herbaceae, also possibly in the species-group Edules. It is not likely that any of these will come to light in the United States, the West Indies, or the lowlands of Central and South America. Some new species likely will turn up in the highlands of Central America and Mexico, and from the poorly collected subandean regions of Colombia, Ecuador, Peru and Bolivia.

As regards range extensions and determination of the limits of distribution of various species, new collections from the regions enumerated above (the highlands of Central America and Mexico and the subandean Colombia, Ecuador, Peru and Bolivia) are of particular interest.

Further substantial progress in our knowledge of American Erythrina will probably come largely through application of experimental taxonomic techniques. In order to understand certain entities, especially in the species-groups Corallodendra, Variegatae and Herbaceae, it is essential to grow, study, and experiment with living

material. For more details see "Problems in the American species of Erythrina". One of the best places for experimentation is probably Atkins Garden & Research Laboratory in Cuba which already possesses a good collection of Erythrina and of other woody Leguminosae. Because this place is in the dry tropics, many Erythrina species will flourish there.

In 1969 and 1970 I hope to assemble for farther cytological work freshly collected seeds of a substantial number of those species of which chromosome numbers are not yet known. The genus Erythrina has been intensely studied by cytotaxonomists; however, additional counts will be very helpful.

The genus Erythrina has been studied in greater detail by chemists than any other genus of tropical Leguminosae. The remains of the very extensive collection of Erythrina seeds assembled by me in the thirties from various parts of the world for studies at Merck Sharp & Dohme Laboratories by Dr. Karl Folkers and his co-workers, have been distributed for studies to three chemical laboratories.

Before long new data should be available on Erythrina alkaloids. New collections of seeds of species hitherto not studied chemically, are contemplated.

Problems in the American species of Erythrina

There seems to be no outstanding problem in the species-groups Fuscae, Cristae-galli, Vernae, Speciosae, Edules, Leptorhizae and Cubenses. New species are expected in the Edules as subandean South America is better collected. Fruit and seeds of E. polychaeta, E. breviflora fma. oaxacana and E. montana are still not known and their collection will be of interest.

Insufficient material of species-group Corallodendra was available to me when I was working on the monograph in 1938/9. In fact even now these species are poorly represented in the herbaria. It is clear that E. peruviana, E. pallida, E. mitis, E. buchii, E. leptopoda, E. elenae, E. eggersii and E. amazonica are sufficiently differentiated and should remain as distinct species. I question what will happen to the poorly understood E. similis and to the three varieties of E. corallodendrum when further extensive collections become available and carefully conducted cultural experiments are made.

The species-group Variegatae presents a problem. E. velutina seems to be confined to the drier tropics. It is found in the West Indies, in northern Venezuela and in northern Colombia; on the west coast it reappears in Ecuador and the Galapagos Islands; on the east coast, in the State of Ceara, Brazil and practically throughout southern Brazil. It will be important to ascertain the real nature of E. grisebachii, confined to Cuba, and of E. velutina fma. aurantiaca, known so far only from the island Fernando Noronha and the State of Ceara, Brazil. As is the case with the members of the species-group Corallodendra, this could be best done by studying cultivated plants of each, grown from seeds side by side. It will also be necessary to reexamine genuine E. velutina as found in Cuba, and very poorly represented in herbaria. I do not exclude the possibility that eventually E. grisebachii may be reduced to a geographic subspecies or a form under E. velutina.

Additional collections of E. flammea, E. polychaeta, two forms of E. breviflora, E. horrida, E. montana, all species of the species-group Corallodendra, E. goldmanii, E. gibbosa, E. costaricensis and E. cochleata will contribute valuable data of one sort or another to a more complete understanding of these species.

In 1939 I discussed in a tentative way the relationship of the species (1:213-216). It is unfortunate that not much progress has been made on this line of inquiry. By now it is clear that knowledge of the chromosome numbers and study of the wood anatomy are of no assistance on this problem.

The distribution of particular alkaloids in the seeds of various species of Erythrina (and as a short cut the comparative paralysis potency values as determined from the seeds) is helpful in some cases in indicating relationships. However, this information has no bearing on the problem of what species-groups are more primitive. I have no direct and irrefutable evidence, but I still believe that the Corallodendra and the Herbaceae are relatively modern and they appear to be still in process of differentiation. These two groups, so abundantly represented in America, are manifestly related. I can suggest no reason why the Herbaceae has so far outstripped the other groups as regards number of species. The Herbaceae contain 21 species; the Corallodendra 10 species and 2 varieties, while eight other species-groups together contain only 20 species and 3 forms.

Comparative study of the wood structure of species of Erythrina

Cozzo (41) studied the comparative wood anatomy of 3 Argentinian species, E. crista-galli ("Seibo"), E. falcata ("Seibo de Jujuy"), and E. dominguezii ("Seibo chaqueno"). This study was made on two authentic wood samples of each species, backed by vouchers. A key is given for separating the three species on anatomical characters of the wood.

Mention has been made in a previous paper (5:633) of a collection of authentic wood samples of Erythrina that I assembled for comparative study concurrently with the seed collection. Unhappily the study of this material was not pursued to a conclusion. I was informed that the similarity in wood structure between many of the species was so great that no taxonomically useful differential characters could be expected to emerge.

I. Fuscae

1. Erythrina glauca Willdenow, Ges. Nat. Freunde Berlin Neue Schr. 3:428.1801.

Chromosome numbers: 2n = 42, voucher: Otero 428 (Krukoff Herb. 9215) from Puerto Rico; 2n = 42, voucher not seen: Servico Forestal s.n. (USDA plant introduction number 150390); 2n = 42, voucher not seen: W. B. Clarke & Co., San Jose, Calif. (BEF 9914-42) from plant cult. in California (6:408).

Cuba: Pinar del Rio: Bro. Leon et al. 19680 (GH); Habana: Bro. Leon 13288 (GH); Las Villas: Atchison 132 (GH); Oriente: Bro. Leon et al. 19090 (GH). Dominican Republic: Jose Js. Jimenez 3764 (US), 4981.

Puerto Rico: Holdridge 193 (A). Guadeloupe: Adrien Questel 4088 (US). Guatemala: Izabal: Steyermark 39705 (F), Jones & Facey 3481. El Salvador: Carlson 1132 (F), 1138 (F); La Libertad: Carlson 298 (F), Allen 7262 (US); La Paz: Allen 7240 (EAP). Honduras: Cortes: L. O. Williams & Molina s.n. (EAP); Camayagua: Valerio Rodriguez 2915 (F), Cox 1404 (EAP); Olancho: Standley 17744 (EAP); El Paraiso: Standley 16551 (F), Molina 5088 (GH), Molina et al. 15686 (F), Carlson 2520 (MICH). Nicaragua: Greenman & Greenman 5765 (M); Zelaya: Long 252 (F), Molina 1970 (F), Salas & Taylor 2860 (EAP); Matagalpa: L. O. Williams et al. 24801 (F); Segovia: Salas & Taylor 2275 (EAP). Costa Rica: Guanacaste: Tarcoles, costa del Pacifico, Mus. Nac. Costa Rica 23387 (CR); Puntarenas: A. Jimenez M. 1676 (F); Heredia: Jorge Leon 1496 (TURIA); Cartago: Cordoba 40 (TURIA), s.n. (Jan. 5, 1952) (EAP), Jorge Leon 4451 (EAP). Panama: Bro. Paul 362 (US), Cotterman & Klawe P-14 (US); Canal Zone: Graham 305 (GH), Stern et al. 3 (GH), Johnston 955 (GH), Tyson 2632 (M); Colon: Allen 4104 (M), 4155 (M). Colombia: Choco: Duke 9825, 10977; Atlantico: Dugand & Jaramillo 2751, L. E. Mora 1396 (COL), Dugand & Garcia-Barriga 02428 (COL), Dugand & Jaramillo 2751; Bolivar: Molina & Barkley 19 Bol 81 (COL); Duque-Jaramillo 4406-A (COL); Antioquia: Metcalf & Cuatrecasas 30068 (M); Valle: Cuatrecasas 22956 (F), R. van Sneidern 1169 (US); Cundinamarca: Garcia-Barriga 13403 (US); Pinto et al. 579 (COL), Garcia-Barriga 13403; Huila: Cordill. Oriental, alt. 3500 ft., E. L. Little, Jr. 8466 (COL); Amazonas: Fernandez-Perez 6881 (COL) (Rio Loretoyacu), Black 46-8. Ecuador: Guayas: A. J. Gilmartin 816 (US), Camp E-3624, Asplund 7705 (S), 16657 (LL); Los Rios: E. L. Little, Jr. 6441. Peru: Loreto: Antonio Arostegui 49 (F), 61 (F). Venezuela: Croizat 929, Tania 1703 (VEN) (Barinas), J. Velez 2627 (VEN) (Las Piedras, alr. Pto Paez); Zulia: Lasser 2619 (VEN); Lara: Steyermark 55545 (F); Merida: Humbert 26834 (US), Breteler 3243 (RB), E. L. Little, Jr. 15174 (VEN); Carabobo: Alston 5638, Ll. Williams 12836 (VEN); Aragua: Ll. Williams 12310 (F); Anzoategui: Foster D. Smith 28 (US); Federal District: Herb. Nac. Ven. 50894 (VEN) and 50895 (VEN) (Los Chorros), Tamayo 1284 (VEN), Aristiguieta 1998 (VEN) (Caracas - Antimano); Monagas: Wurdack & Monachino 39445, Steyermark 61766 (F), 62049 (F), 62149 (F); Bolivar: Ll. Williams 12560 (VEN). Guiana: basin of the Courantine River, Forest Dept. 5395. Surinam: Stahel 622 (US), Landsbosh 136, 190. Brazil: Territory Amapa: Egler & Irwin 46681 (IAN) (basin of Rio Jari), Irwin 48782 (IAN) (basin of Rio Oiapoque), J. B. R. J. 57611 (RB) (Macapa), Froes & Black 27645 (IAN) (basin of Rio Araguari); Para: Ledoux 236 (IAN) (Marajo), Pires 609 (Belem, Utinga), Black 48-2950 (IAN) (Igarape Pixuna, Antonio Lemos), Ducke s.n. (Aug. 19, 1913) (PG) (Collares praia), J. B. R. J. 11961 (RB) (Ilha Mexiana), M. Goeldi s.n. (Oct. 14, 1901) (PG), Huber s.n. (June 12, 1908) (PG) (Hort. Bot. Belem), Sigueira s.n. (Aug. 13, 1903) (PG); Amazonas: basin of Rio Madeira, J. B. R. J. 117088 (RB); basin of Rio Solimoes, Ducke s.n. (Sept. 10, 1904) (PG); Territory Guapore: Herb. Bradeanum 27440 (HB), Duarte 7210 (INPA); Piaui: Parnaiba: Lima 42 (IAN); Ceara (cult.): Ducke s.n. (July 3, 1908) (PG); Pernambuco: Ducke & Lima 76 (PERN); Bahia: Belem et al. 1373 (UB), 1375 (UB), 1311 (UB) and 1377 (UB) (Ilheus), H. Veloso 4 (US), 5 (US), Inst. Bot. Sao Paulo 34381 (SP), N. T. Silva 58326 (UB); Minas Geraes: Herb. Vicosa 1591 (VIC); Espirito Santo: basin of Rio Doce: cult. (shade for cacao), J. B. R. J. 63074 (RB); Rio de Janeiro and Guanabara: cult.: J. B. R. J. 867 (RB), 7494 (RB), 41435 (RB), 11898 (RB); Sao Paulo: cult. Inst. Bot. Sao Paulo 48509 (SP) (Campinas).

Local names: Amapola (Dominican Republic); Cambulo (Valle, Colombia); Amaiza (Loreto, Peru).

Distribution: The second most frequently collected species of the genus in the Americas and one of two (the other being E. berteroana) which occurs both in the West Indies and in Central and South America.

In the West Indies it has been collected in Cuba (Pinar del Rio, Habana, Las Villas and Oriente), Jamaica, Dominican Republic, Puerto Rico, Guadeloupe, Martinique, St. Vincent, Tobago and Trinidad.

In Central America it has been collected in Guatemala (Izabal and Jutiapa), El Salvador (La Libertad, La Paz), Honduras (Cortes, Comayagua, Yoro, Olancho and El Paraiso), Nicaragua (Zelaya, Segovia, Matagalpa, Granada and Rivas), Costa Rica (Guanacaste, Alajuela, Puntarenas, Heredia, Cartago and San Jose) and Panama (Bocas del Toro, Canal Zone, Colon and Panama).

In South America it has been collected in Colombia (Magdalena, Atlantico, Bolivar, Antioquia, Valle, Cundinamarca, Cauca, Huila and Amazonas), Venezuela (Zulia, Lara, Merida, Carabobo, Apure, Aragua, Federal District, Guarico, Anzoategui, Monagas, Delta Amacuro and Bolivar), the three Guianas, Ecuador (Guayas and Los Rios), Peru (Loreto), Brazil (Amapa, Para, Amazonas, Guapore, Piaui, Bahia, Pernambuco and Minas Geraes) and Bolivia (El Beni).

In summing up its distribution this species is found in the West Indies and on the continent from Guatemala south into Peruvian, Brazilian and Bolivian Amazonia.

The species is used extensively as a shade for cacao and coffee and its range has been greatly extended by this use. As a result it is often difficult to ascertain whether the tree is indigenous to certain localities or escaped from cultivation. It is a lowland species, although some specimens from Colombia, Venezuela, and Guatemala are said to have been collected at altitudes of 800 to 1200 meters.

Specimens from trees in cultivation were seen from Belize, Guatemala (Escuintla), Brazil (Ceara, Bahia, Espirito Santo, Rio de Janeiro, Guanabara and Sao Paulo), Ceylon and the Camerouns (West Africa).

II. Cristae-galli

2. Erythrina crista-galli L. Mant. 99. 1767.

Chromosome numbers: 2n = 40, 44 (Tschechow, W. and Kartaschowa, Cytologia 3:221-249. 1932); 2n = 42, voucher: Rawitscher s.n. (Krukoff Herb. 2952) from Brazil, Sao Paulo; 2n = 42, voucher not seen: McClintock from a plant cultivated in California (I accept the identification of this plant by McClintock without any reservations as she knew this species, as evidenced by her paper (44:57); 2n = 42, voucher not seen: Servico Forestal s.n. (USDA plant introduction number 150388) from Brazil; 2n = 42, voucher not seen: Henry A. Dreer s.n. (BEF 1194-35); 2n = 42, voucher not seen: BEF 7-38 from Montevideo, Uruguay (6:408).

U.S.: California: Bracelin 1406 (F), 1485, 1486 (F)(Berkeley), Klawe 1572 (US) (San Diego); Illinois: Chicago, Garfield Park, Ohlendorf s.n. (July, 1890) (F); Pennsylvania: Philadelphia, Kilvington s.n. (US); Washington, D. C., Botanical Garden, Rose 1180 (US); Missouri: Kammerer s.n. (Oct. 2, 1946); South Carolina: Clemson College, Anderson 1526 (US); Georgia: Savannah: Bachus s.n. (May 16, 1927) (F), Bisset s.n. (May 16, 1927) (US), Mississippi: Clarkson s.n. (1937) (F). Cuba: Habana: Bro. Leon 16948 (GH). Dominican Republic: J. Jc. Jimenez 3050 (US). Guatemala: Alta Verapaz: Molina & Molina 12357 (F). Costa Rica: J. Leon 300 (F), Solis Rojas 179 (M), Mus. Nac. Costa Rica 24046 (CR); San Jose: Mus. Nac. Costa Rica 24553

(CR) and 26868 (CR) (Desamparados), 34219 (CR) (Escazu), 25483 (CR); Alajuela: Mus. Nac. Costa Rica 25236 (CR). Brazil: Minas Geraes: Herringer 3536 (UB), 7127 (UB), Inst. Bot. Sao Paulo 48485 (SP) (Pocos de Caldas), 79560 (SP) (Lagoa Dourada); Rio de Janeiro and Guanabara: Goes & Constantino 238, J. B. R. J. 124185 (RB) (Passo Fundo), Pabst 7131 (HB) (entre Floriano y Quatis), J. B. R. J. 112779 (RB) and 112781 (RB) (Horto Florestal, cult.), 44434 (RB) and 77922 (RB) (cult.); Sao Paulo: Rodriguez 3356 (M), de Paiva Coelho 2383 (M), J. B. R. J. 13378 (RB), 69956 (RB) (Rio Bracicaba), 17255 (RB) (Lorena), Inst. Bot. Sao Paulo 28329 (SP) (Rio Jaguary), 51750 (SP) (Salto), 19317 (SP) (Pauso Alegre), 13441 (SP) (Jundiahy), Inst. Bot. Sao Paulo 65866 (SP), Pickel 5005 (PERN) (cult.); Parana: J. B. R. J. 29174 (RB) and 59409 (RB) (Palmyra), 29175 (RB) (Sao Matheus), Inst. Bot. Sao Paulo 58286 (SP) (Piraquara), Hatschbach 12023 (F), Gurgel 19; Santa Catarina: J. B. R. J. 53914 (RB) (Nova Teutonia), 73403 (RB) (prope Laguna), L. B. Smith & Klein 8142 (US), Reitz & Klein 9397 (US); Rio Grande do Sul: Pereira 8680 (HB), Rambo 35491 (M), 44550 (M), 49155 (D), Inst. Bot. Sao Paulo 46574 (SP) (Sao Leopoldo). Paraguay: Hassler 10514, 9335. Argentina: Jujuy: Araque & Barkley s.n. (Nov. 28, 1949); Tucuman: Schreiter 775, 61296 (US); Santiago del Estero: Russet 103 (GH); Misiones: Spegazzini s.n. (Jan. 10, 1907) (A); Corrientes: Pedersen 3008 (M), 4798, Lourteig 820, Ybarrola 2928 (M); Buenos Aires: Rodriguez V. 525.

Distribution: The fourth most frequently collected species of the genus in the Americas and by far the most frequently cultivated outside of its natural range.

Attention is called to the fact that all specimens from the West Indies, North and Central America and Peru are from cultivated plants, the species not being indigenous to these countries.

Known native from eastern Brazil, eastern Bolivia, Paraguay, northern Argentina and Uruguay. The specimens seen from the following states and provinces: Brazil (Maranhao, Minas Geraes, Rio de Janeiro, Guanabara, Sao Paulo, Parana, Santa Catharina and Rio Grande do Sul), Bolivia, Paraguay, Argentina (Jujuy, Tucuman, Santiago del Estero, Chaco, Santa Fe, Misiones, Corrientes, Entre Rios and Buenos Aires) and Uruguay.

Specimens from trees in cultivation were seen from U.S.A. (California, Missouri, Kentucky, Mississippi, Georgia and Florida), Bermuda, Cuba, Jamaica, Guadeloupe, Martinique, Trinidad, Guatemala, Costa Rica, Peru, Guiana, Africa and Australia. The species is also often grown in greenhouses in Europe and in the U.S.A. and in botanical gardens in the tropics.

In one of my previous papers I discuss E. x bidwillii (E. herbacea x E. crista-balli (1:232). Three additional specimens of this hybrid were examined: China: Canton: Dalhstrom 519 (1/2-1951) (S), Levine s.n. (Herb. Canton Christian College 1764 (A); Honolulu: coll. undesign. s.n. (June 1927) (S).

On December 28, 1942 E. crista-galli was declared a National Flower of Argentina, and in 1967 "Erythrina, the Coral tree" was dedicated as the official tree for the City of Los Angeles.

Gavio published a paper (42) dealing with "anomalias en el androceo" in this species particularly in the number of stamens, and in anther arrangement and structure. He mentions that more or less similar anomalies were reported for E. herbacea (Penzig, O. Pflanzen-teratologie systematisch geordnet, Berlin 1921-1922). In the monograph, under E. americana, I stated: E. enneandra was described on the basis of a plant of unknown origin cultivated in Hort. Bot. Monsp. I have seen the type and it manifestly belongs

with E. americana. The absence of the tenth stamen in flowers on the specimen in my opinion has no consequence. I have seen obviously abnormal flowers in specimens of at least two species of Erythrina with 9 and 11 stamens".

3. Erythrina falcata Bentham in Martius. Fl. Bras. 15(1):172. 1859.

Chromosome numbers: 2n = 42, voucher: Silva s.n. (Krukoff Herb. 15062) from Brazil; 2n = 42, voucher not seen: Servico Forestal s.n. (USDA plant introduction number 150389) from Brazil (6:408).

Peru: Cook & Gilbert 768 (US); Cuzco: Urubamba: Ellenberg 879 (U); Junin: Soukoup 2286 (F); Madre de Dios, C. Vargas C. 14672 (US). Brazil: Bertha Lutz 16 (R), 1689 (R); Minas Geraes: Duarte 251, Mello Barreto 11205 (BHMG), Herringer 3486 (HB), Beoncini 1045 (R), Herb. Vicosa 2228 (VIC), J.B.R.J. 111902 (RB), 111903 (RB) and J. G. Kuhlmann 2228 (US) (Vicosa); Inst. Bot. Sao Paulo 37449 (SP) and 37552 (SP) (Belo Horisonte); Inst. Bot. Sao Paulo 45876 (SP) and J.B.R.J. 45636 (RB) (Estac. Exper. Coronel Pacheco); Inst. Bot. Sao Paulo 37553 (SP) and 37678 (SP)(Tombas); Mendes Magalhaes 655 (BHMG), s.n. (Sept. 27, 1941) (IAN) (munic. de Betim, Ibirete), J. Evangelista de Oliveira 591 (IAN) (munic. Santa Luzia), J.B.R.J. 88694 (RB)(Faz do Rasgao, Paraopeba), Duarte & Castellanos 251 (HB); Rio de Janeiro and Guanabara: J.B.R.J. 43332 (RB) and 80782 (RB)(Serra dos Orgaes); J.B.R.J. 50472 (RB)(Petropolis), Dionisio & Octavio 64, Brade 16406, J.B.R.J. 43613 (RB) and 77924 (RB)(cult.); Sao Paulo: Pickel 5002 (PERN), J.B.R.J. 17258 (RB)(Lorena), Inst. Bot. Sao Paulo 50145 (SP)(amparo), 59664 (SP), 733 (SP)(Butantan), 44443 (SP)(Jard. Bot. cult.), 65865 (SP)(Parque do Estado, cult.), Pickel 3528 (M); Parana: Lindeman & de Haas 2758 (U), 3252 (U), 3340 (U), 5612 (U), J.B.R.J. 115698 (RB)(50 km de Curitiba); Santa Catarina: J.B.R.J. 72796 (RB)(Tijucas), 112782 (RB)(Santa Luzia), Reitz & Klein 7211, 7487, Reitz 2230(US), J.G. Kuhlmann s.n. (J.B.R.J. 72796); Rio Grande do Sul: Rambo 43871 (US). Argentina: Salta: Meyer 3534 (GH), Schreiter 10625 (US), 11438; Tucuman: Meyer 12643 (M); Misiones: Rojas s.n. (Sept. 2, 1922)(A). Bolivia: Cochabamba: cult. (alt. 2560 m), Cardenas 2804 (US)(fl. red, "Chilicchi"), 2417 (US)(fl. white, "Ceibo blanco"). Australia: Brisbane Bot. Garden, A. Bolin s.n. (Oct. 1967)(cult.).

Local names: Suinan and Mochocho (Sao Paulo, Brazil).

Distribution: Subandean southern Peru (Junin, Cuzco and Madre de Dios) and Bolivia (La Paz and Cochabamba), eastern Brazil (Maranhao, Minas Geraes, Rio de Janeiro, Guanabara, Sao Paulo, Parana, Santa Catarina and Rio Grande do Sul), Paraguay and northern Argentina (Jujuy, Salta, Tucuman, Santa Fe and Misiones).

Cultivated in Argentina (Buenos Aires) and a favorite street tree in Sorata, Province of Larecaja, Dept. of La Paz, Bolivia.

III. Vernae

4. Erythrina poeppigiana (Walpers) O.F. Cook, Bull. U.S. Dept. Agr. Bot. 25:57. 1901.

Cuba: Las Villas: Gonzales 600, M. Lopez F. 1981 (US). Jamaica: Proctor 11885 (A). Dominican Republic: Jose Js. Jimenez 1622 (US). Puerto Rico: N. Almeyda s.n., E. L. Little, Jr. 13534 (F). Guatemala: Alta Verapaz: Steyermark 44843 (US); Santa Rosa: Standley 78078 (F). El Salvador: Ahuachapan: Standley & Padilla 2798 (F); Santa Ana: Allen & Garcia 7215 (US). Honduras: Morazan: Molina 2707 (GH), Standley 16006 (F), 25844 (F). Colombia: Magdalena: Oscar Haught 4028 (US) (alt. 200 m); Norte de Santander: Cuatrecasas 13004 (US) (alt. 600-830 m); Valle: Cuatrecasas 14504 (US)

(alt. 1000 m), 14563 (US), 16136 (F), 23018 (US) (alt. 950 m); Cundinamarca: Duque-Jaramillo 3217 (COL) (1750-2080 m), Garcia-Barriga 11906 (US) (alt. 1660 m); Meta: Allen 3328 (M) (alt. 600 m); Cauca: Idrobo-Fernandez 207 (US) (alt.1110 m); Huila: Schultes & Villarreal 5100 (COL) (1300 m), E. L. Little, Jr. 7456 (US) (alt. ± 1000 m); Narino: J. A. Ewan 15964 (US); Putumayo: T.A. Sprague 380 (US), Schultes & Smith 2080 (GH), Cuatrecasas 11013 (US); (alt. 400 m). Ecuador: Santiago-Zamora: Harling 1132 (S) (alt. 600 m); Esmeraldas: Asplund 16556; Los Rios: Acosta Solis 10735 (F), E. L. Little, Jr. 98257 (F); El Oro: Steyermark 53780 (M); Napo-Pastaza: Asplund 10218 (US). Peru: Woytkowski 34398 (F); San Martin: Ramon Ferreira 1569 (US); Loreto: Woytkowski 398 (M), Ramon Ferreira s.n. (1958) (US). Venezuela: Saers 839 (VEN), Bernardi s.n., Tanayo s.n. (F), Bro. Elias 139b (F), Ll. Williams 9968 (US); Lara: Steyermark 55550 (F); Trujillo: Steyermark 55852 (F) (alt. 1065-1220 m); Tachira: Alston 7066; Yaracuy: Curran 229, Burkart 16390 (VEN); Miranda: Bernardi s.n. (Nov. 21, 1956), Aristiguieta 1999 (VEN); Anzoategui: Steyermark 61182 (F), 61502 (F); Monagas: Steyermark 62169 (F) (alt. 850 m), Foster D. Smith 214 (US); Zulia: Lasser 2529 (VEN); Sucre: cult. in cacao plantation, Steyermark 95132 (VEN); Merida: E. L. Little, Jr. 15586 (VEN), 15587 (VEN) (cult.), 15792 (VEN) (alt. 1800 m), Aristiguieta 5270 (VEN); Federal District: Pittier 14392 (VEN). Brazil: Amazonas: Boca do Acre, Prance et al. 2385; Territory Roraima: Rio Branco, Vasconcellos D. Coelho s.n. (INPA 10990); Bahia: cult., H. Veloso 2 (US); Sao Paulo: J. B. G. P. 33471 (SP) (Fazenda Santa Eliza, cult.), 59665 (SP) (Jard. Bot. Sao Paulo, cult.). Bolivia: Yungas: Kelly 1023 (MA).

Local names: Cachingo (Huila, Colombia); Pu-ru-to-kaspi (a "bean tree"- by Indians in Putumayo, Colombia); Chucho or Rojizo or Peonia (Colombia).

Distribution: This is the fifth most frequently collected species of the genus in the Americas and by far the most frequently grown as a shade for coffee and cacao.

Attention is called to the fact that E. poeppigiana is not indigenous to the West Indies or to Central America. All specimens from these regions are either from cultivated plants or from escapes.

Known native in western South America from Venezuela and Panama (southern Darien) in the north throughout subandean Colombia, Ecuador, Peru and Bolivia, and in western portions of Peruvian, Brazilian and Bolivian Amazonia.

Specimens were seen from the following countries: Cuba (Habana, Mantanzas, Las Villas and Oriente), Jamaica, Haiti, Dominican Republic, Puerto Rico, Guadeloupe, Martinique, Trinidad, Tobago, Guatemala (Alta Verapaz and Santa Rosa), El Salvador (Ahuachapan, Santa Ana and San Salvador), Honduras (Atlantida and Morazan), Nicaragua (Managua), Costa Rica (Limon, San Jose and Cartago), Panama (Canal Zone), Colombia (Norte de Santander, Boyaca, Caldas, Valle, Tolima, Cundinamarca, Meta, Cauca, Huila, Narino, Putumayo and Caqueta), Venezuela (Zulia, Falcon, Lara, Merida, Trujillo, Tachira, Yuracuy, Carabobo, Federal District, Miranda, Sucre, Anzoategui, Monagas and Bolivar), Ecuador (Esmeraldas, Los Rios, El Oro, Napo-Pastaza and Santiago-Zamora), Peru (San Martin, Loreto, Huanuco and Cuzco), Surinam (cultivated), Brazil (Territory of Acre) and Bolivia (El Beni and La Paz).

5. Erythrina ulei Harms, Verh. Bot. Ver. Brand. 48:172. 1907.

Ecuador: H. G. Barclay 4976 (COL); Napo-Pastaza: Asplund 9258 (US). Colombia: Schultes 3501 (GH) (Rio San Miguel o Sucumbios). Peru: Huanuco: Asplund 12624 (US); Junin: Hutchison 1202 (US) (Fl. Aug.) (alt. 800 m). Brazil: Amazonas: basin of Rio Jurua, Cruzeiro do Sul, Froes 21691 (IAN); Maranhao: near Carolina, Pires & Black 1583.

Distribution: Peru (Loreto, Huanuco, Junin and Cuzco), Colombia, Ecuador (Napo-Pastaza), Bolivia (La Paz and Cochabamba) and Brazil (Amazonas, Para and Maranhao). Specimens from Bolivia were obtained at elevations of 500-1600 m.

6. Erythrina dominguezii Hassler, Physis 6:123. 1922.

Chromosome numbers: 2n = 42, voucher: Schulz s.n. (Krukoff Herb. 15126) from Argentina, Chaco (6:408).

Bolivia: La Paz: cult. in Coroico, Isabel Kelly 1039 (F). Paraguay: Pavetti Morin 1516 (MICH). Argentina: Salta: Schreiter 5025 (F); Jujuy: Ledesma, Cabrera & Fabus 15970 (MUN).

Distribution: Western central Brazil (Mato Grosso), eastern Bolivia (Santa Cruz), Paraguay and northern Argentina (Jujuy, Salta, Formosa and Chaco).

A specimen was seen from a tree cultivated at Sao Paulo, Brazil.

7. Erythrina verna Vellozo Fl. Flum. 304. 1825.

Chromosome numbers: 2n = 42, voucher: Krukoff Herb. 17932 from Brazil (6:409).

Brazil: Bahia: Cruz das Almas (cult.), J. B. R. J. 132218 (RB); Minas Geraes: J. B. R. J. 71798, Macedo 1141 (M), J. Evangelista de Oliveira 1095 (IAN), Inst. Bot. Sao Paulo 47424 (SP) (Piau), 45877 (SP) (Estac. Exper. Coronel Pacheco), J. B. R. J. 45635 (RB) (Estac. Exper. Coronel Pacheco, Herringer 7698 (UB), J. Evangelista de Oliveira 603 (BHMG) (cult.); Goias: Duarte 10578 (HB), Sidney 193 (UB); Rio de Janeiro and Guanabara: J. B. R. J. 2751 (RB) (Sta Maria Magdalena), 38067 (RB), also 15379 (RB), 47960 (RB) and 111899 (RB) from cultivated plants; Sao Paulo (cult.): Pickel 2133 (M), 5000 (PERN).

Distribution: Central and southern Brazil (Maranhao, Bahia, Territory of Acre, Goyaz, Minas Geraes, Rio de Janeiro, Guanabara and Sao Paulo). Doubtless occurs also in Mato Grosso, Brazil, also in Peru and Bolivia adjacent to the Territory of Acre.

On the label of Inst. Bot. Sao Paulo 47424 is stated: "Mulungu de flor branca. Flores quasi brancas".

The local name "Mulungu" has been recorded for 6 of 12 species of Erythrina which are found in Brazil, (E. poeppiguana, E. ulei, E. verna, E. speciosa, E. amazonica and E. velutina). In this connection it is interesting to note that according to E. G. Baker the local name for E. excelsa Baker(= E. bagshawei Bak. fil.), native to Uganda, East Africa is "Murungu" (39:369).

8. Erythrina flammea Herzog, Repert. Nov. Sp. 7:57. 1909.

Bolivia: Santa Cruz (Buena Vista): Herzog 72 (Z, type).

Herzog states on the label: "Haufiger Baum in der Waldern bei Buena Vista, ca. 400 m, Oct. 1907". This species is known from 6 collections and additional ones would be of considerable interest.

Distribution: Eastern Bolivia (Santa Cruz) and adjacent Brazil (Mato Grosso).

IV. Speciosae

9. Erythrina speciosa Andrews, Bot. Repos. 7: pl. 443. 1806.

Chromosome numbers: 2n = 42, voucher: Cabral s.n. (Krukoff Herb. 16666) from Brazil, Sao Paulo (6:409).

Brazil: Bahia: Veloso 3 (US), Belem & Magalhaes 1092 (UB) (rodovia Rio Branco-Itabuna, plantacao de cacao), N. T. Silva 58369 (UB); Minas Geraes:

Belem 1612 (UB), Mendes Magalhaes 690 (UB), Herb. Vicosa 1566 (VIC); Munic. Belo Horizonte (cult.), J. Evangelista de Olivenca 1094 (IAN); Distrito Federal: Irwin et al. 8428 (UB), Herringer s.n. (UB); Espirito Santo: Belem 1572 (UB); Rio de Janeiro and Guanabara: restinga de Tijuca, J.B.R.J. 75730 (RB); Petropolis, J.B.R.J. 50471 (RB) and 62394 (RB); Jacarepagua, J.B.R.J. 46980 (RB), 107021 (RB) and 109671 (RB); Horto Florestal (cult.), J.B.R.J. 81427 (RB) and 111900 (RB); Jard Bot. (cult.), J.B.R.J. 47959 (RB) and 90487 (RB); Horto Museu Nac. (cult.), J.B.R.J. 111215 (RB); pr. Passea Tres, Herb. Bradeanum 34312 (HB); Sao Paulo: Pickel 4892 (PERN); Lorena, J.B.R.J. 17256 (RB); Parque do Estado, Inst. Bot. Sao Paulo 65858 (SP); Campinas, Fazenda Santa Elisa (cult.), Inst. Bot. Sao Paulo 48508 (SP); Inst. Bot. Sao Paulo 38525 (SP) (cult.); Parana: G. Hatschbach 6212 (US); coastal plain, Lindeman & de Haas 2633 (U); Santa Catarina: Reitz & Klein 3533, 8970.

Distribution: Southeastern Brazil (Bahia, Minas Geraes, Distrito Federal, Espirito Santo, Rio de Janeiro, Guanabara, Sao Paulo, Parana and Santa Catarina).

Specimens were seen taken from trees in cultivation in Costa Rica (Turrialba) and Peru.

A striking small tree and a good addition to tropical arboreta.

10. Erythrina polychaeta Harms, Notizbl. Bot. Gart. Berlin 9:295. 1925.

Ecuador: Bolivar: Acosta Solis 5847 (F) (alt. 1800 m), 6847 (F) (alt. 2600-3000 m) (Cord. Occident., Salaya).

Local names: Poroto or Hortiga de montana (Ecuador).

Distribution: Known only from 4 collections from central Ecuador (Los Rios, Bolivar and Chimborazo). Specimens were obtained at an elevation of 1800-3000 m.

Fruits and seeds of this species not seen, presumably resembling those of the related species, E. edulis and E. schimpffii. Additional collections of this species, especially in fruit, would be of interest.

11. Erythrina schimpffii Diels, Bibl. Bot. 116:96. 1937.

Ecuador: Guayas: Camp E-3746 (alt. 333-400 m); Bolivar: Acosta Solis 6368 (F) (alt. 800-1100 m), 6498 (alt. 800 m) (F); Los Rios: Asplund 5533 (S), Fagerlind & Wibom 2641 (S), Harling 287 (S); Cotopaxi: Sparre 17119 (S).

Distribution: Known only from Ecuador (Guayas, Pichincha, Tungurahua, Los Rios, Cotopaxi, Bolivar and Chimborazo). Specimens were obtained at an elevation of 270-1600 m.

V. Edules

12. Erythrina edulis Triana; M. Micheli, Jour. de Bot. 6:145. 1892.

Venezuela: Tachira: Steyermark & Dunsterville 101,274 (alt. 2000-2400 m). Colombia: Karsten s.n., E. L. Little, Jr. 7121; Magdalena: Kernan 108 (US) (alt. 1480 m); Norte de Santander: Cuatrecasas 12878 (US) (alt. 1200-1500 m); Antioquia: Bro. Daniel 933 (US), J. Araque M. & F. A. Barkley s.n. (Jan. 21, 1949) (US) (alt. 2700 m), Hodge 6826 (US); Medellin, Sandeman 5534 A (COL) (alt. 2333 m), Hno Daniel s.n. (COL); Valle: Dryander 122 (M) (1400 m), Cuatrecasas 15429 (US) (alt. 1250-1400 m); Cundinamarca: Garcia-Barriga 12495 (US) (alt. 1650-1820 m), Fernandez & Mora 1457 (US) (alt. 2080 m), R. E. Schultes 6599A (US), Duque 492 (COL) (alt. ± 1800 m), Duque-Jaramillo 3369 (COL) (alt. ± 2600 m), Garcia-Barriga 12414 (COL) (alt. 1150-1400 m), Cuatrecasas 13557 (COL) (alt. 2230-2300 m); Cauca: Dryander 2114 (US) (alt. 2300 m), Fosberg 20477 (US) (alt. 1800 m), Kjelf von Sneidern 5620 (US), Cuatrecasas 19504 (A) (alt. 1780-1900 m), H. G. Barclay 5200

(COL); Huila: Cordill. Orient., (alt. ± 2300 m), E. L. Little, Jr. 8047 (COL), Romero-Castaneda 6573 (COL) (alt. 1600-1700 m); Putumayo, Valle de Sibundoy, Bristol 598 (COL) (alt. 2200 m), Cuatrecasas 11450 (US) (alt. 1600-1800 m), P. Fray Miguel 65 (F) (alt. 2250-2400 m). Ecuador: Cotopaxi: Mathias & Taylor 5187 (LA), Sparre 17327 (S); Esmeraldas: E. L. Little, Jr. 96753 (F); Guayas: Fagerlind & Wibom 657 (S), Camp E-3643 (alt. 333-417 m); Pichincha: Sparre 17050 (S) (alt. 2200 m), Asplund 16705 (LL) (alt. 2550 m), Casalet & Pennington 5030, Acosta-Solis 10910 (F) (alt. 800 m), Carlos Jativa & Carl Epling 559 (LA) (alt. 300-400 m); Tungurahua: Asplund 8020 (US) (alt. 2500 m); Los Rios: Carlos Jativa & Carl Epling 89 (LA) (alt. 70 m); Bolivar: Acosta Solis 6732 (F) (alt. 2000-2600 m), 6833 (F) (alt. 2600-3000 m); Chimborazo: Acosta Solis 5219 (F) (alt. 600 m), 5225 (F) (as to leaves), 5592 (F) (alt. 2500 m), 13957 (F) (alt. ± 300 m), Wiggins 11061; El Oro: Steyermark 53780 (F) (alt. 2135-2285 m); Azuay: Steyermark 52929 (F) (alt. 1645-2315 m), Camp E-537, E-2198, E-4403; Loja: Sparre 18861 (S) (alt. 2000 m), Harling 6040 (S), Wiggins 10883, Asplund 18033 (R); Napo-Postaza: Harling 3921 (S). Peru: Cajamarca: Woytkowski 6975 (F) (alt. 2700 m); Amazonas: Hutchison & Wright 3871 (LA), 6831 (LA) (alt. 1750-1850 m); Woytkowski 8118 (M) (alt. 1600 m); Loreto: Ll. Williams 4178 (F); Pasco: Soukup 3307 (US) (alt. 1700 m); Cuzco: Vargas 2801 (M).

Local names: Poroto-hortiga or Poroton or Sacha-Poroto (Bolivar, Ecuador). Poroto de arbol (Chimborazo, Ecuador). Camparote de montana (Azuay, Ecuador).

Distribution: Throughout subandean Colombia (Magdalena, Norte de Santander, Antioquia, Boyaca, Caldas, Valle, Tolima, Cundinamarca, Cauca, Huila and Putumayo), Ecuador (Esmeraldas, Guayas, Pichincha, Tungurahua, Los Rios, Bolivar, Chimborazo, Canar, El Oro, Azuay, Loja and Napo-Postaza), Peru (Cajamarca, Amazonas, Loreto, Ancachs, Huanuco, Pasco, Junin, Ayacucho, Apurimac and Cuzco), also in Venezuela (Tachira) and probably in Bolivia (La Paz).

Largely confined to altitudes from 1000 to 3000 m, although found also at lower elevations. Cultivated extensively throughout its range.

Five collections from Ecuador have leaves grading into E. polychaeta. The leaflets of these collections are bullate but not regularly setose-aculeate as in E. polychaeta (Acosta Solis 6732, Steyermark 52929, 53780, Garcia-Barriga 12414 and Harling 3921).

VI. Leptorhizae

13. Erythrina breviflora De Candolle, Prodr. 2:413. 1825.

Mexico: Lyonnet 880 (US) (valle de Tepeite); Jalisco: Keith Roe et al. 2151 (WIS) (alt. 1800 m), Barcena 617 (MEXU), McVaugh 13166 (US) (alt. 2100-2200 m), 13582 (MEXU) (alt. 2000-2250 m), 14381 (MICH)(Sierra de Caule, alt. 2100 m); Colima: Barcena 459 (MEXU); Michoacan: Ugent & Flores 1742, 6127, Barkley et al. 2703, E. L. Little, Jr. 11101, McVaugh 13210 (MEXU) (alt. 1800 m), Manning & Manning 5310 (GH), King & Soderstrom 5060, 5128; Mexico: Keith Roe et al 1687 (WIS) (alt. 2000 m), 1761 (WIS) (alt. 1950 m), Matuda et al. 26949 (alt. 1500 m), 31551 (US) (alt. 1500-1900 m), Hinton 527 (US), Miranda 550 (MEXU), Rzedowski s.n. (Sept. 3, 1965) (ENCB) (alt. 2000 m); Morelos: L. Paray 1623 (ENCB), J. Espinosa 364 (ENCB), R. Palaeios s.n. (Sept. 24, 1964) (ENCB) (alt. 1900 m), s.n. (Aug. 22, 1964) (ENCB) (alt. 2100 m); Federal District: Miranda 591 (ENCB); Hidalgo: Hinton 11513 (GH), McCorcle & Rowell, Jr. 3454 (MICH), Rowell, Jr. 3223 (MICH).

Distribution: At higher elevations from Jalisco and Guanajuato in the north, throughout Michoacan, Morelos and Mexico to and including Oaxaca in the south (Jalisco, Guanajuato, Colima, Michoacan, Mexico, Morelos, Federal District, Hidalgo and Oaxaca). The range apparently does not overlap those of either fma. petraea or fma. oaxacana.

King & Soderstrom 5060 is the first specimen in fruit seen by me. Seeds are black and fruits and seeds resemble those described for E. breviflora fma. petraea (1:255).

13a. Erythrina breviflora fma. petraea (Brandegee) Krukoff, Brittonia 3:255. 1939.

Distribution: Known only from 5 collections of C. A. Purpus from the State of Puebla, Mexico, where it is confined to higher elevations. Its range apparently is distinct from those of typical E. breviflora and E. breviflora fma. oaxacana.

Additional collections of this forma would be of considerable interest.

13b. Erythrina breviflora fma. oaxacana Krukoff, Brittonia 3:256. 1939.

Distribution: Known only from 3 collections from the State of Oaxaca, Mexico, where it is confined to higher elevations (± 1800 m). Its range apparently is distinct from those of typical E. breviflora and E. breviflora fma. petraea. Fruits and seeds of this form were not seen but presumably resemble those of E. breviflora and E. breviflora fma. petraea.

Additional collections of this forma would be of considerable interest.

14. Erythrina leptorhiza De Candolle, Prodr. 2:413. 1825.

Mexico: Herb. M. Urbina s.n. (March 1883) (MEXU) (Cerro de Cuatepec); San Luis Potosi: McVaugh 12285 (US) (alt. 2350 m); Jalisco: Gregory & Eiten 249 (M), Weintraub & Roller 148 (MICH); Guanajuato: Gilly 136 (MICH); Hidalgo: West H-8 (WIS) (alt. 2550 m), C-17 (WIS) (alt. 2500-2900 m), Matuda 21543 (MEXU); Michoacan: Dressler 1158 (M), E. L. Little, Jr. 11012 (MICH); Mexico: F. Takaki s.n. (May 11, 1958) (ENCB) (alt. 2300 m), Hitchcock & Stanford 7011 (US) (alt. 2833 m), Martinez 15059 (M), Matuda 21094 (MEXU), 26297 (US) (alt. 2400 m), 28275 (US) (alt. 290 m), Hinton 15402 (MICH), Beaman 3360 (US) (alt. 3500 m); Federal District: Lyonett 3246 (US), Salazar s.n. (May) (MEXU), s.n. (June) (MEXU); Morelos: J. Espinosa s.n. (Nov. 13, 1960) (alt. 2270 m), Carlos Dios & Dilio Fuentes s.n. (May 16, 1957) (ENCB); Tlaxcala: R. Galicia 6 (ENCB) (alt. 2200 m), Rzedowski 11 (ENCB), Balls 4826 (US) (alt. 2266 m); Puebla: Sharp 44567 (MICH), Miranda 2762 (MEXU), C. E. Smith, Jr. et al. 3916 (alt. 1800-2200 m).

Distribution: At higher elevations from the States of Jalisco, Guanajuato and Hidalgo in the north to and including Michoacan and Puebla in the south (San Luis Potosi, Jalisco, Guanajuato, Hidalgo, Michoacan, Mexico, Federal District, Morelos, Tlaxcala and Puebla). It appears that its range does not overlap the much more restricted ones of two related species, E. horrida and E. montana.

15. Erythrina horrida De Candolle Prodr. 2:413. 1825.

Local names: Sompantla (district Ixtlan, Oaxaca, Mexico).

Distribution: Endemic to Oaxaca, Mexico, where its range apparently does not overlap those of the two related species, E. leptorhiza and E. montana.

16. Erythrina montana Rose & Standley, Contr. U. S. Nat. Herb. 20:179. 1919.

Mexico: Durango: H. S. Irwin 1246, Johnston 2675 (MICH), Maysilles 7001 (MICH), 8194 (MICH), Waterfall & Wallis 13537 (F) (fl. Aug.); Aguas Calientes: McVaugh 18259 (MICH); Nayarit: McVaugh 16411 (MICH), 16454 (MICH),

Gentry 11017 (MEXU), Feddema 689 (MICH) (alt. ± 1000 m), 918 (MICH) (alt. 1600-1800 m).

Distribution: Western central Mexico (Sinaloa, Durango, Zacatecas, Aguas, Calientes and Nayarit) where it occurs at higher elevations (1600-2900 m). The range of this species apparently does not overlap those of the two related species, E. leptorhiza and E. horrida.

Mature seeds not seen.

VII. Corallodendra

17. Erythrina peruviana Krukoff, Brittonia 3:262. 1939.

Ecuador: Santiago-Zamora: Mathias & Taylor 5231 (US) (fl. July, no leaves), Sparre 19203 (S) (alt. 800 m); Napo-Pastaza: Asplund 8964 (S) (fl. & fr.).

This is the first collection in fruit. Pods subligneous, ± 24 cm long, deeply constricted between seeds, many-seeded; seeds scarlet (some with small indistinct blackish markings) without a black line near the hilum. Mathias & Taylor state on the label: "small tree with pink flowers", whereas Sparre's label reads: "flowers deep yellow". Additional collections of this species would be of considerable interest.

Distribution: Known only from 4 collections; one from Peru (Loreto) and three from Ecuador.

18. Erythrina pallida Britton & Rose, Bull. Torrey Club 48:332. 1922.

Chromosome numbers: 2n = 42, voucher: Wortley s.n. (Krukoff Herb. 9257) from Trinidad (6:409).

Tobago: Hunnewell 19942 (GH). Venezuela: Aristeguieta 4976 (US); Falcon: Paraguana: franja inferior cerro Sta. Ana, Tamayo 806 (VEN); Lara: Tamayo 3830 (El Eneal, Duaca) (VEN), 3854 (Dpt. Crispo, estacas vivas en los cercos) (VEN), Moreno 10 (VEN), E. L. Little, Jr. 16257 (600 m) (VEN); Miranda: Higuerote (600 m), F. Tamayo 4665 (fl. & fr. Dec. 12, 1963) (VEN); Federal District: cult. at Jard. Bot. in Caracas from seeds received from Lara, Tamayo 4644 (VEN), Aristeguieta 5265 (VEN).

Distribution: St. Vincent, Tobago, Trinidad, Margarita and probably other neighboring islands (?Martinique); also Venezuela (Falcon, Lara, Miranda).

19. Erythrina mitis Jacquin, Hort. Schoenb. 2:47. 1797.

Venezuela: Croizat 474, 938: Trujillo (cult. in hedges): Burkart 16650 (VEN) (fl. Apr.); Yaracuy: Curran 255, Aristiguieta & Foldats 1247 (VEN) (fl. Dec), 1491 (VEN) (fl. Dec.); Carabobo: Tamayo 2238 (VEN) (fl. Febr.); Bolivar: (?) Blanco 228 (VEN), Marshall Turner 150 (F), Steyermark 88233 (VEN) (fl. Jan. 8) (Altoplano Nuria, alt. 300-500 m), 88666 (VEN) (fl. Jan. 21)(Altoplano Nuria, alt. 230 m); Miranda: Aristiguieta 3804 (VEN) (fl. Jan.) (alt. 200 m), Bernardi 5934 (VEN) (fl. Dec.), s.n. (Nov. 22, 1956), s.n. (Nov. 27, 1956).

Distribution: Venezuela (Trujillo, Yaracuy, Carabobo, Miranda, Federal District and Bolivar).

20. Erythrina buchii Urban, Repert. Sp. Nov. 17:157. 1921.

Chromosome numbers: 2n = 42, voucher not seen: Holdridge s.n. from Haiti. I accept the identification by Holdridge without reservation as he knew this very distinctive species and collected specimens of it (Holdridge 947) (6:408).

Haiti: Gros Cheval (alt. 1500 m), Holdridge 947.

Distribution: Endemic to Haiti (Massif de La Selle) where it is rather

common at elevations of about 1200 m and is also planted for living fence posts.

21. Erythrina leptopoda Urban & Ekman, Ark. Bot. 20A (5):14. 1926.

Distribution: Endemic to Haiti (Massif de la Selle) where it is common above 700 m and is also planted for living fence-posts.

21a. Erythrina elenae Howard & Briggs, Jour. Arn. Arb. 34:183. 1953.

Cuba: Las Villas: R. Howard et al. 377 (A, type, NY, IAN) ("Rocky hill slope ¼ mile west of Rio San Juan which is crossing road to Trinidad"), Howard 5336 (Trinidad Mts., limestone).

Distribution: Known from 2 collections from Las Villas, Cuba.

The original description is ample. This is one of the most distinctive species in the genus and can be immediately recognized on the vegetative characters (leaves). Although flowers are not yet known I am tentatively placing it in the group Corallodendra. It is doubtless endemic to Cuba. The collectors describe the species as a tree 30 ft. high which has a trunk with spines or corky growths.

Additional collections of this species, especially in flower, would be of considerable interest.

22. Erythrina eggersii Krukoff & Moldenke, Phytologia 1:289. 1938.

Chromosome numbers: 2n = 42, voucher: Atchison 252 (8/7-47) (US) (cited as "E. horrida" in 6a:544), from a plant cultivated at the Atkins Garden & Research Laboratory, Soledad, Cienfuegos, Cuba.

Distribution: Puerto Rico and Virgin Islands (Vieques and St. Thomas). Occasionally planted there as a fence tree.

23. Erythrina amazonica Krukoff, Brittonia 3:270. 1939.

Chromosome numbers: 2n = 84, voucher: Froes 11842 (Kr. Herb. 15117) from Brazil, Maranhao, Island of Sao Luiz (6:408).

French Guiana: Leblond 198 (1792) (G). Guiana: basin of the Rupununi River, Forest Dept. 3660. Surinam: Tresling 340 (U), Kramer & Hekking 2665 (U). Brazil: Para: Ducke 1655 (F) (flores roseas) (near Belem), 1960(RB) (Rio Branco de Obidos), s.n. (Aug. 5, 1912) (PG) (Rio Branco de Obidos, Matta, Uaussuzal), Pires 1395 (IAN) (Vigia), Silva 170 (IAN) (Vigia, beira do Rio Vigia); Maranhao: Black et al. 54-16575 (IAN) (arbusto; flores roseas), Ducke s.n. (Sept. 25, 1903) (PG) (Alcantara, capueira), J.B.R.J. 4758 (RB) (Carurupu). Colombia: La Serrania (entre los rios Ariari y Meta, 270 m alt.). Cuatrecasas 7816 (US); Vichada: Cano Sama: Nicolino Mattar s.n. (July 1947).

Distribution: At low elevations in Colombia (Putumayo), Peru (Loreto), French Guiana, Surinam, Guiana, and Brazil (Amazonas, Para and Maranhao).

All collections in fruit have bicolored seeds (red and black) except for Froes 2515 (from the basin of Rio Pindare, Maranhao) which has seeds uniformly red.

Ducke gives an excellent description of the occurrence of this species in the Brazilian Amazonia: "Arvore pequena, aculeada, com bellas flores cor de coral e entao desfolhada; em estado indubitavelmente espontaneo no "uaussuzal" (matta com predominio da palmeira "uauassu": Orbignyia speciosa) do pequeno Rio Branco ao nordeste de Obidos. Cultivada em Belem e muitas outras partes do Brasil tropical (chamada "mulungu", como as demais especies de flores rubras)."

24. Erythrina similis Krukoff, Brittonia 3:271. 1939.

Distribution: Known only from 3 collections, one each from Brazil (Mato Grosso), Bolivia and Paraguay.

Fruits and seeds not seen. Additional collections of this species would be of interest.

25. Erythrina corallodendrum L. var. corallodendrum, Sp. Pl. 706. 1753.
Jamaica: Yuncker 18024 (F), Howard & Proctor 15123 (A), Proctor & Mullings 22038 (GH), Hunnewell 11063 (GH), Powell 979 (MICH). St. John: Woodworth 155 (F). Curacao: cult., Fr. Arnaldo 2084 (US).
Distribution: Jamaica, Haiti and St. John.
Planted in Jamaica as a fence-post.

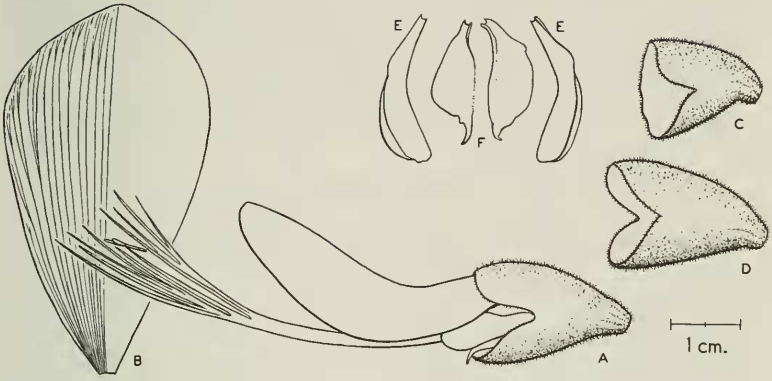
25a. Erythrina corallodendrum var. bicolor Krukoff, Brittonia 3:275. 1939.
Chromosome numbers: 2n = 42, voucher Ward s.n. (Krukoff Herb. 15202) from St. Lucia (6:408).
St. Kitts: Wingfield Ravine, Proctor 19274 (BR). Antigua: Box 1468 (F, US) (fr. June). Marie Galante: Proctor 20963 (BR). St. Lucia: Pamela Beard 1077 (GH). St. Vincent: Cooley 8450 (GH), Morton 4714 (US). Grenada: Howard 10958 (GH).
Distribution: St. Kitts, Antigua, Montserrat, Guadeloupe, Marie Galante, Dominica, Martinique, St. Lucia, St. Vincent and Grenada.
Additional collections of this entity would be of considerable interest. They may help to demonstrate whether or not it is best treated as a form rather than a variety.

25b. Erythrina corallodendrum var. connata Krukoff, Brittonia 3:276. 1939.
St. Thomas: Orsted s.n. (1845-48) (US).
Distribution: St. Thomas, St. Croix and probably other neighboring islands.
Fruits and seeds of this species not seen.
Additional collections are needed to verify whether or not this variety has a distinct geographical range and to check whether or not the color of the seeds is correlated with characters in flowers (connate keel-petals, etc.).

VIII. Cubenses

26. Erythrina cubensis C. Wright, Sauv. Anal. Acad. Ci. Habana 5:336. 1869.
Cuba: Pinar del Rio: Bro. Leon 18073 (GH); Las Villas: Clement 6342 (GH); Oriente: Hno Alain et al 5405 (GH), Bro. Leon 17932 (GH), Bro. Hioram 7270 (GH).
Distribution: Endemic to Cuba (Pinar del Rio, Isla de Pinos, Las Villas and Oriente).

26a. Erythrina oliviae Krukoff, sp. nov. inter congeneres calycis campanulati tubo de latere ad medium fisso bilabiato, vexillo late elliptico, carinaeque petalis apice acuminatis praestans.
Arbores mediocres ad anthesin saepissime foliatae, trunco spinis armato, ramulis robustis saepe aculeatis; petioli juniores pubescentes mox glabrati 5.5--14 cm longi espinosi; petioluli 3--7 mm longi 0.5--1 mm diam, ut petioli demum glabrati; foliolorum laminae tenuiter chartaceae juniores ut petioli pubescentes mox glabrae subtus nec spinosae nec ceriferae; foliolum terminale late ovatum vel subrotundum 3.5--8.5 cm longum 3.7--8 cm latum, apice rotundatum vel emarginatum basi late cuneatum vel truncatum, venis secundariis utroque latere saepissime 5 percursum; inflorescentiae rachis pedicellique floriferi non visi; calyx fere 2 cm longus 1.3 cm diam, junior breviter puberulus demum glabratus vel glaberrimus, campanulatus paullo antrorsus curvatus bilabiatus, tubo utroque latere ad medium fere fissus (nonnumquam uno latere integro) labiis integerrimis subaequilongis truncato-rotundatis; vexillum arcuato-recurvum elliptico-obovatum valde obtusum haud stipitatum ± 6 cm longum 2.5 cm latum, ad anthesin (fide collectoris) vivide aurantiaco-bubalinum saturatius lineolatum; alae oblanceolatae



Erythrina oliviae Krukoff

A. Flower
B. Standard
C, D. Calyces
E, F. Wings & keel-petals

leviter falcatae fere 2 cm longae 8 mm latae, basi angustatae, apice valde obtusae ultra medium concavae vel involutae carinae paullo longiores; carinae petala ± 1.8 cm longa 6.5 mm lata inter se secus margines exteriores rectas coadunata, basi in unguiculum ± 2 mm longum angustata, lamina semiobovata apice abruptiuscule acuminato-caudata; androecii fere 8 cm longi filamenta per ± 3 cm inter se libera, antherae lineares ± 6.5 mm longae; pistillum ad 7.2 cm usque longum, pilis pallidis dense cinereo-pubescens; pedicelli fructiferi ± 9 mm longi 2 mm diam; legumen 20--24 cm longum ± 1.7 cm diam, basi in stipitem ± 3.5 cm longum, apice in rostrum gracile ± 2 cm longum contractum, inter semina compluria inaequaliter paulloque constrictum; semina ± 18 mm longa 8 mm lata, immatura aurantiaco-lutea dein saturate rubra, ventre linea lata nigra de hilo chalazam versus ± 3 mm longa notata.

Type locality: El Papayo, mpo. de Ahuhuetitla, Puebla, Mexico.

Distribution: Known only from the type locality.

Mexico: Puebla: El Papayo (k. 264 Oaxaca highway, ± 16 mi. WNW of Acatlan de Osorio, elev. ± 1300 m), Olivia Converse 134 (lvs., fls., and frs., Apr. 26, 1952, Jan. 3, 1954, Jun. 1962), US, type, NY, isotype; s.n. (lvs., frs., Aug. 19, 1962), NY, US.

The collector's label on Converse 134 reads: "collected from a line of 8 trees, evidently grown from stakes placed for a fence..trees about 10 m high; trunks about 50 cm..tree spiny..the largest leaflets 5.4 x 5.8 cm..inflorescences 18 to 30 cm..standard 9 cm long x 3 cm wide when open, a soft yet vivid orange-buff color, with marked veinings; keel-petals and wings ± 2.5 cm, bright reddish-orange..fruits 20-24 cm long, very unevenly constricted..seeds 15 x 7 mm, very variable in their shades of buff.."

The collector's label on Converse s.n. reads: "there are many more trees of the same species in the "monte", including one growing by the dry river on opposite side of road from those collected". The species appears to be in flower in April/June.

This is a strongly marked species, without close relatives in the genus, best placed in the species-group Cubenses. The combination of small leaflets, irregularly cleft calyx, broad banner, and apically acuminate keel-petals is an unique one. In the material examined the majority of calyces are cleft on one side only, but one calyx is cleft half-way on both sides, becoming 2-lipped in consequence. Examined rapidly, the calyx cleft on only one side suggests the spathaceous calyx of E. velutina but there the cleft is situated behind the standard and the orifice of the calyx is strongly oblique. The calyx cleft on both sides suggests that of E. cubensis, which also has a rather broad standard, but obtuse, apically unappendaged keel-petals. Keel-petals more or less acute at apex occur in several subgroups of the species-group Herbaceae as defined in the monograph (1), but always associated with a narrower standard and a campanulate or tubular-campanulate calyx entire or minutely undulate-toothed around the orifice. The oblanceolate, obtuse, distally involute wings which are a trifle longer than the keel are suggestive of the Herbaceae, a group highly differentiated in Mexico and Central America, and it seems likely that E. oliviae represents a specialized offshoot from this large species-group.

IX. Herbaceae

27. Erythrina herbacea L. Sp. Pl. 706. 1753.

Chromosome numbers: n = 21, 2n = 42 (Senn, H.A. Bibliographica Genetica 12:175-336. 1938); 2n = 42, voucher not seen: Servico Forestal s.n. (U.S.E.A.

plant introduction number 150391) (this identification should be verified as I have not seen any specimens of this species cultivated in Brazil); 2n = 42, voucher: White s.n. from Myrtle Beach, South Carolina; 2n = 42, voucher: White s.n. from Holden Beach, North Carolina; 2n = 42, voucher not seen: Lewis & Oliver 5234 from Texas, Nacogdoches Co. (Lewis, Walter H. et al., Rhodora 64:151. 1962) (6:408, 409).

U.S.: about 80 collections were examined and annotated. They are not cited here as the distribution of this species in the U.S. is well known. Mexico: Troll 229 (MOR); Tamaulipas: Wiggins 13352 (D), Kenoyer & Crum 3315 (A), R. Merrill King 4509, Viereck 794 (US), Dressler 1878 (MICH), Johnston 5228 (MICH), 5242 (MICH), Barkley & Smith s.n. (Apr. 4, 1947) (F); San Luis Potosi: Rzedowski 6959 (ENCB), Barkley s.n. (Apr. 13, 1947); Hidalgo: Moore 2882 (MO); Veracruz: Mario Sousa 2377 (MEXU), Dressler & Jones 14, A. Gomez P. & R. Riba 72 (MEXU); Puebla: Miranda 8380 (MEXU); Oaxaca: Alexander 135, L. Gonzales C. s.n. (March 3, 1964) (ENCB).

Distribution: Southeastern U.S. (Texas, Louisiana, Mississippi, Alabama, Georgia, South Carolina and Florida) and eastern Mexico (Tamaulipas, San Luis Potosi, Hidalgo, Veracruz, Puebla and Oaxaca).

I have not seen any specimens of this species from North Carolina. However, a specimen is cited (6:409) as collected by Dr. O. E. White at Holden Beach, Brunswick County.

Specimens from plants in cultivation were seen from Bermuda and Cuba.

This is the third most frequently collected species of the genus in the Americas.

In a summary of her paper Atchison (6:413) states: "E. herbacea..contains both herbaceous perennial and arborescent forms. These growth habits are apparently hereditary and at least merit separation into varieties"..

She discusses the species also elsewhere in her paper (6:410-411): "Herbaceous plants transferred to a greenhouse at the Blandy Experimental Farm have kept their normal habit. Perennial and arborescent characters in E. herbacea are probably hereditary and not merely the result of response to climate conditions. Further investigation may prove the two forms worthy of varietal, if not specific separation".

I already discussed the above matter at length back in 1939 in the monograph (1:284): "In the northern portion of its range the species is a perennial herb with a very thick fleshy root, which sends up several stems to about 1 meter high which die every year; the long leafless rachises commonly proceed directly from the root. In tropical Florida and Mexico it becomes a shrub or a small tree up to 6 meters, often with a single stem. I am in agreement with Standley that the shrubby form seems to differ from the typical E. herbacea only in habit and in heavier pubescence of rachises and pedicels and therefore does not merit any taxonomic designation. In this connection it is noteworthy that E. crista-galli, a large tree in its native habitat in South America, dies back to the root every year if grown outdoors in England".

I am not prepared to recognize the arborescent form even as a geographical variety as in Texas and elsewhere occur forms intermediate between the extremes mentioned by Atchison. Furthermore, I do not find any characters for separating any forms treated here as E. herbacea..

Incidentally, as I stated in the monograph (1:284), the first specific name proposed for the shrubby form of E. herbacea appears to be E. rubicunda. Recently I examined the type of it (Herb. Jacq. s.n. (1806), (W).

For information on the more or less similar situation in E. flabelli-

formis, see under that species. On rocky ground and mountain slopes in Arizona the plants are with large roots which send up several shoots, thus forming shrubs about 1 meter high with several stems. In the southern portion of its range in Mexico it becomes a tree.

28. Erythrina coralloides De Candolle, Prodr. 2:413. 1825.

Mexico: Martin 007 (MICH); Nuevo Leon: Meyer & Rogers 2895 (U) (1900 m); San Luis Potosi: Rzedowski 5783 (ENCB), 8737 (ENCB) (alt. 2100 m), 8767 (ENCB) (alt. 1450 m); Guanajuato: Kenoyer 1797 (A), Gilly 137 (MICH); Hidalgo: L. Gonzalez Quintero 2286 (ENCB) (alt. 1900 m); Mexico: Dodds & Simpson 28 (MICH), Bourgeau 1188 (FI), Legro 115 (FI); Federal District: Matuda 21035, Espinosa 668 (ENCB) (cult.); Morelos: Miranda: 9315 (MEXU); Puebla: Merrill King 2280 (MICH), Bro. Arsene s.n. (Aug. 1907) (US), 128a (US) (alt. 2160 m), 2372 (US); Oaxaca: Cox 1623 (EAP).

All specimens of Bro. Arsene are from the vicinity of Puebla.

Distribution: Eastern Mexico (throughout Nuevo Leon, Tamaulipas, San Luis Potosi, Guanajuato, Queretaro, Hidalgo, and in eastern Jalisco, Michoacan, Guerrero, Mexico, Federal District, Morelos, Puebla and Oaxaca.

McClintock (44:53) states: "E. coralloides has been known in California as E. poianthes. This error may perhaps be traced to a color plate in Curtis' Botanical Magazine (No. 3234, published in 1833) labelled E. poianthes. This plate is an excellent representation of the tree, grown in California, and also, surely of E. coralloides, although it apparently has not been assigned to this species. Krukoff, in his revision of the American species of Erythrina (Brittonia 3:205-237. 1939) referred to this plate in his treatment of E. speciosa (=E. poianthes) and did not accept it as representing this species. He however, did not further identify the plate".

My statement to which McClintock refers reads as follows: "I cannot accept the plate (Curtis' Bot. Mag. 60: pl. 3234, 1833), said to be of E. poianthes, as of E. speciosa, as the seeds are shown on the plate as red, and as keel-petals are separate and smaller than wings". It is quite obvious that the plate in question is an excellent representation of E. coralloides except that the keel-petals in this species are connate whereas they are shown to be separate on the plate.

29. Erythrina flabelliformis Kearney, Trans. N.Y. Acad. 14:32. 1894.

Chromosome numbers: 2n = 42, voucher: Jones s.n. (Krukoff Herb. 9485) from Arizona; 2n = 42, voucher not seen: BEF 1136-38 (USDA plant introduction number 123862) (inasmuch as these seeds bear the USDA plant introduction number, they must come from a foreign country, probably Mexico where E. flabelliformis is found; if this is the case then the identification should be verified, as this species is often confused with E. coralloides and other species) (6:408).

U.S.: about 45 collections were examined and annotated. They are not cited here as the distribution of this species in the U.S. is well known. Mexico: Lower California: Wiggins 5574 (MICH), J.H. Thomas 7863 (US), Gentry & Fox 11868 (LL), Carter & Ferris 3111 (D), 3437 (D); Sonora: Wiggins 1354 (D), White 507 (MICH), 2761 (MICH), 2813 (MICH), 4097 (MICH), Muller 3654 (MICH), Martin 56077 (MICH), Straw & Forman 1600 (MICH); Chihuahua: Knobloch 1130 (MICH), G. Borja L. B-366 (ENCB); Durango: Lundell 13003 (MICH); Jalisco: Pringle 4011 (MEXU), Gentry & Gilly 10895 (MEXU), McVaugh 14891 (MICH) (fr. June) (ca 10km. SW of Lagos de Moreno, alt. 2000-2100 m), 15093 (MICH), 16811 (MICH) (fr. Aug.) (near Cerro La Campana, alt. 2100-2300 m); Zacatecas: 5 miles NE of Jalpa, alt. 1500 m, McVaugh 18486 (MICH) (fr. Aug.).

Local names: Zumpantla (Jalisco).

Distribution: In southeastern Arizona (counties Pinal, Pima and Cochise) and in southwestern New Mexico (Grant county), U.S., and in western Mexico (throughout Lower California and Sonora, in northern Sinaloa, western Chihuahua, Durango, Zacatecas, central Jalisco and northwestern Michoacan).

This species is a small shrub in Arizona and a tree 5 - 8 m high in the southern part of its range in Mexico (see for example annotations on Carter & Ferris' specimens from Lower California). The plant occurs in Arizona at an elevation of up to 5000 ft.

30. Erythrina lanata Rose, U.S. Dept. Agr. N. Am. Fauna 14:81. 1899.
Erythrina occidentalis Standl. Contr. U.S. Nat. Herb. 20:180. 1919.

Mexico: Sinaloa: Gonzalez Ortega 22 (MEXU), 1194 (MEXU), 5416 (ENCB); Nayarit: Mason 1787 (Tres Marias) (D), Chavez & Villamar s.n. (fl. Jan.) (Isla Maria Madre) (ENCB), Feddema 1049 (MICH), Gentry & Gilly 10717 (LL), McVaugh 12068 (US); Jalisco: Wilbur & Wilbur 1373 (MICH); Colima: Gilly et al. 7 (MICH), McVaugh 15782 (MICH), McVaugh & Koelz 1453 (MICH), 1609 (MICH), Miranda 9083 (MEXU) (fl. Dec.); Mexico: Hinton 10030, H. Bravo H. 3397 (MEXU) (fl. July); Guerrero: Miranda 4329 (MEXU) (fl. March), Kruse 249 (fl. March); Oaxaca: McVaugh 22417 (MICH); Chiapas: Ocozocuantla, Moore 2543 (GH).

Local names: Colorin or Chilicote or Peonia (Sinaloa).

Distribution: Western central and southern Mexico (Sinaloa, Jalisco, Colima, Michoacan, Mexico, Nayarit, Guerrero, Oaxaca and Chiapas).

In the monograph I stated: "E. occidentalis perhaps should not be regarded as specifically distinct from E. lanata. I have retained the name for the time being because the majority of specimens of E. lanata are quite incomplete and were obtained from several widely separated localities, and it is therefore difficult to form a clear concept of the species. The specimens from the State of Sinaloa and Tres Marias Islands, here treated as E. occidentalis, form a compact group with fairly uniform large pods, large seeds, and small thin calyces."

Abundant new collections (including specimens from Sinaloa and Tres Marias Islands) examined and cited in this paper show that E. occidentalis cannot be maintained as a distinct species.

32. Erythrina berteroana Urban, Symb. Ant. 5:370. 1908.

Chromosome numbers: 2n = 42, voucher: Petersen s.n. (Krukoff Herb. 9705) from Guatemala, Escuintla; 2n = 42, voucher: Owen Smith s.n. (Krukoff Herb. 9637) from Guatemala, Solola; 2n = 42, voucher not seen: Walsingham s.n. from Cuba, Atkins Gard. & Research Lab. I accept the identification of this plant by Walsingham without any reservations as he knew this species and he sent me seeds and specimens of it - Krukoff Herb. 9133 (Walsingham s.n.) (6:408); 2n = 42, voucher: coll. undesign. 254 from Central America (under the name "E. neglecta Krukoff") (6a:544).

Cuba: Isla de Pinos: Morton 10141 (US); Las Villas: Gonzales 473, Howard 4884 (M). Dominican Republic: Allard 13473 (US). Puerto Rico: E. L. Little, Jr. 13771. Mexico: Veracruz: Sierra de Tuxtla, R. F. Andrle 3 (US); Chiapas: Esperanza, Escuintla, Matuda 17601. Guatemala: Alta Verapaz: Steyermark 44270; Zacapa: Steyermark 43322 (F); Retalhuleu: Standley 88031 (F); Suchitepequez: Krukoff 67-3, Steyermark 47801 (F); Sacatepequez: Breedlove 11407 (US); Escuintla: Standley 89273 (F), 89607 (F); Santa Rosa: Standley 78544 (F). El Salvador: Allen & Armour 6833 (EAP); Ahuachapan: Standley & Padilla 2514 (F); La Libertad: Carlson 93; Morazan: Tucker 799 (F). Honduras: Cortes: Molina 3569; Comayagua: Valerio Rodriguez 2510 (F); Morazan: Pfeifer 1689 (US) (alt. 1000 m), Glassman 1716, Molina 231 (GH),

Standley 16168 (F), Standley & Padilla 1937 (F), 1953 (F), L. O. Williams & Molina 14926 (EAP) (alt. 1100 m); Olancho: Standley 18153 (EAP) (alt. 450-500 m); El Paraiso: Valerio Rodriguez 1906 (F), Molina 858 (F), Standley 16608 (EAP) (alt. 700-800 m), 25788 (EAP) (alt. 930 m). Nicaragua: Esteli: Standley 20389 (EAP) (alt. 680 m); Jinotega: Standley 9519 (F), 10583 (F). Costa Rica: Forsch 755 (G) (near Coyolar, alt. 160 m), Cufodontis 316 (G) (Irazu, alt. 2000 m); Guanacaste: Brenes 823 (G), Dodge & Thomas 6445 (M), Mus. Nac. Costa Rica 36776 (CR) (Sierra de Tilaran), Paul Shank s.n. (EAP) (Aug. 7, 1950) (alt. 955 m); Alajuela: Naranjo, alt. 1150 m, Austin Smith 10004 (G); Zarcero, alt. 1000 ft., Oton Jimenez & Lankaster s.n. (CR), Orozco 378 (EAP), Jorge Leor 2315 (EAP) (alt. 1500 m); San Jose: Herb. Pittier 3056 (CR) (alt. 1200 m), Mus. Nac. Costa Rica 24640 (CR) (La Uruca), 30678 (CR) (San Antonio de Belen, Fuente de Mulas), 30595 (CR) (Hacienda La Trinidad, Montes de Oro); Puntarenas: Palmar 33 (alt. ± 900 m); Cartago: Forsch 216 (M) (alt. ± 2000 m). Panama: Hicken 1594 (US), Stern et al. 990 (M), Allen 1631 (US); Chiriqui: Stern et al. 1146, Woodson & Schery 151 (GH), Allen 3663 (M), Davidson 735 (US) R. Merril King 5320 (US); Veraguas: Blum & Tyson 593 (M); Los Santos: Dwyer 2150 (M); Canal Zone: Duke 11737, Harvey 5221 (F), 5225 (F), Dwyer 1237 (M), Blum 542 (M), Stern et al. 351 (M); Darien: Duke 10366. Colombia: Choco: munic. Riosucio, Romero-Castaneda 6109 (COL) (alt. 200 m), Oscar Haught 5489 (US) (alt. 100 m); Magdalena: Romero-Castaneda 842 (COL), 874 (COL), Oscar Haught 4160 (F), Echeverria 331, Rafael Romero C. 843 (US); Goajira: Cuatrecasas & R. Romero C. 25475 (US); Atlantico: Dugand & Jaramillo 4064 (COL) (alt. 200-250 m). Venezuela: Zulia: Lasser 2529 (VEN), Aristiguieta & Montoya 2057 (VEN) (Machiques).

Distribution: The most frequently collected species of the genus in the Americas and one of two (the other being E. glauca) which occur both in the West Indies and also in Central and South America.

In the West Indies it has been collected in Cuba (Pinar del Rio, Isla de Pinos, Habana, Matanzas, Las Villas, Camaguey and Oriente), Haiti, Dominican Republic and Puerto Rico.

On the continent it has been collected in Mexico (Veracruz, Chiapas), Guatemala (Huehuetenango, Alta Verapaz, Quezaltenango, Zacapa, Retalhuleu, Suchitepequez, Solola, Sacatepequez, Chiquimula, Escuintla, Guatemala, Santa Rosa and Jutiapa), El Salvador (Ahuachapan, Santa Ana, Sonsonate, La Libertad, San Salvador and Morazan), Honduras (Cortes, Morazan, El Paraiso, Olancho and Comayagua), Nicaragua (Segovia, Jinotega, Matagalpa, Leon, Managua and Granada), Costa Rica (Guanacaste, Puntarenas, Alajuela, Heredia, San Jose and Cartago), Panama (Chiriqui, Veraguas, Los Santos, Cocle, Canal Zone, Darien and Panama), Colombia (Choco, Magdalena, Guajira, Atlantico and Bolivar) and Venezuela (Zulia).

Specimens from trees in cultivation were seen from Mexico, Colombia (Antioquia) and Africa (Tanganyika).

32a. Erythrina guatemalensis Krukoff, Amer. Jour. Bot. 28:688. 1941.

Chromosome numbers: 2n = 42, voucher: "Rosengarten s.n. (Krukoff Herb. 9799)" (my files show that Krukoff Herb. 9799 (Crawford s.n.) is of E. eggersii; the identification cited by Atchison (6:408) therefore needs verification).

Guatemala: Alta Verapaz: Standley 90463 (F), Williams et al. 40396 (F); El Progreso: Steyermark 43613 (F); Zacapa: Steyermark 42364 (F). Honduras: Morazan: L. O. Williams & Molina 13723 (F), L. O. Williams 17451 (EAP).

All specimens cited above were collected at the elevation of ± 1400-± 2700 meters.

Distribution: Confined to the highlands of Guatemala (Alta Verapaz, Baja Verapaz, El Progreso and Zacapa) and Honduras (Morazan).

In Guatemala often planted in hedges.

33. Erythrina americana Miller, Gard. Dict. ed. 8, #5. 1768.

Chromosome numbers: 2n = 42, voucher: Krukoff 1a from Mexico, Morelos (6:408).

Mexico: Bourgeau 2305 (FI) ("Vallee de Cordoba"), Troll 361 (MUN); Tamaulipas: F. Martinez M. & G. Borja L. 2079 (MEXU) (alt. 800 m) (fr. Sept.), 2752 (fr. Sept.); Veracruz: Wawra 737 (W) (Tuxpan), Maria Souza 2851 (MEXU) (fr. Sept.), Clausen s.n. (Aug. 8, 1955), von Hagen s.n. (F), C. L. Smith 1420; Hidalgo: Moore 1914 (GH); Mexico: Dodds & Simpson 28 (MICH); Morelos: Miranda 233 (MEXU) (fr. May), 1196 (MEXU) (fr. March), 4109 (MEXU) (fr. May), 9288 (MEXU) (fr. Sept.); Puebla: C. E. Smith 4091 (US) (alt. 1000-1800 m) (fr. July), L. Gonzalez Quintero 754 (ENCB) (fl. Apr.), Bruff 1175 (MEXU) (fr. Dec.). Africa: Kenya: Nairobi Arboretum (#120), cult. G. R. Williams 451 (M); Natal: Port Shepstone, cult., W. Wlarais 1135 (M).

Local names: Cosquelite (Tamaulipas); Pemuche, Colorin (Veracruz).

Distribution: Central-eastern and central Mexico (Tamaulipas, San Luis Potosi, Hidalgo, Veracruz, Colima, Mexico, Federal District, Morelos, Puebla, Guerrero and Oaxaca). Specimens from plants in cultivation were seen from U.S. (Alabama and Texas), Europe, Cuba, Hawaii and Africa (Kenya and Natal).

34. Erythrina standleyana Krukoff, Brittonia 3:301. 1939.

Chromosome numbers: 2n = 42, voucher Atchison 265 (8/30-47) (US), from a plant cultivated at the Atkins Garden & Research Laboratory, Soledad, Cienfuegos, Cuba (6a:544).

Mexico: Yucatan: Lundell & Lundell 7453 (MICH), 8045 (MICH), Klawe M-2B (US).

Distribution: Western Cuba (Pinar del Rio and Isla de Pinos), southeastern Mexico (Campeche and Yucatan), Belize and northeastern Guatemala (Peten). Confined to the lowlands.

Specimens from plants in cultivation were seen from Cuba. In Mexico it is planted in hedges. This species is represented from Guatemala by a single collection and additional ones would be of interest.

35. Erythrina chiapasana Krukoff, Brittonia 3:304. 1939.

Mexico: Veracruz: Gomez-Pompa 1159 (MEXU) (Sierra de Chiconquiaco, alt. 1280 m); Chiapas: munic. Tuxtla, Breedlove 9612 (US) (fl. Apr.); munic. Comitan, Breedlove & Raven 14147 (US) (fr. Nov.); munic. Venustiano Carranza, Breedlove 10088 (US) (fr. May), Breedlove & Raven 20101 (US) (fl. June); munic. Ixtapa, Breedlove 13788 (US) (fl. Oct.); munic. Bochil, Breedlove 8850 (US) (fl. Febr.); munic. La Trinitaria, Breedlove & Raven 13198 (US) (fr. Oct.); munic. Tenejapa, Breedlove 6098 (US) (fr. July); munic. Huistan, Breedlove 7338 (US) (fl. Nov.); La Chacona, Enrique Lopez 7380 (MEXU) (fr. Aug.); N.N.O. del Mactumacza, Miranda 5934 (MEXU) (fl. Jan.); cerros N. O. de Comitan, Miranda 5066 (MEXU) (fl. Dec.). Guatemala: Huehuetenango: near Huehuetenango (alt. 1880 m), Standley 65712 (F) (fl. Febr.).

Distribution: Mexico (Veracruz and Chiapas) and Guatemala (Huehuetenango).

Breedlove's specimens were collected at elevations of 1170-(1900)-2333 meters. Standley 65712 was previously identified as E. berteroana.

36. Erythrina goldmanii Standley, Contr. U.S. Nat. Herb. 20:181. 1919.

Chromosome numbers: 2n = 42, voucher Atchison 257 (8/27-47) (US) from a plant cultivated at the Atkins Garden & Research Laboratory, Soledad, Cienfuegos, Cuba (6a:544).

Mexico: Chiapas: N. Chicomuselo, Miranda 7079 (MEXU) (fl. March); munic.

Tuxtla, Breedlove & Raven 13511 (US) (alt. ± 733 m) (fl. Oct.); munic. La Trinitaria, Breedlove & Raven 8447 (US) (alt. ± 1,000 m) (fl. Jan.).

Distribution: Known only from the State of Chiapas, Mexico.

37. Erythrina rubrinervia H. B. K., Nov. Gen. & Sp. 6:434. 1824.

Chromosome numbers: 2n = 42, voucher not seen: Lindsay s.n. (BEF S-8814-41) from Panama, Canal Zone, (this identification should be verified as this species is not found in Panama); 2n = 42, voucher: Jaramillo s.n. (Krukoff Herb. 9181) from Colombia (6:409).

Venezuela: Merida (alt. 2000-2600 m), Aristiguieta 3337 (US), Breteler 3145 (RB), Bernardi 6859; Tachira: Steyermark & Dunsterville 100536; Lara: Tamayo 3335 (VEN). Colombia: Magdalena: Foster & Earle Smith 1423 (COL) (alt. ±2370 m); Antioquia: Duque 1482 (US)(alt. 1500 m), Sandeman 5597 (COL); Santander: Cuatrecasas & Garcia-Barriga 9872 (US) (alt. 2300 m); Boyaca: Ranghel Galindo 135 (COL); Caldas: Arbelaez & Cuatrecasas 6463 (US) (alt. 1800-1900 m); Cundinamarca: Cuatrecasas 13558 (US) (alt. 2230-2300 m), 13597 (US) (alt. 1600-1700 m), Martin Grant 0501 (US), Garcia-Barriga 11055 (US) (alt. 1550-1580 m), 11735 (COL) (1040-1320 m), 11970 (US) (alt. 1780 m), 12327 (COL) (alt. 1040-1320 m), 12359 (COL) (alt. 1040-1700 m), 17451 (COL) (alt. 2050-3100 m), Duque-Jaramillo 3217 (COL) (alt. 1750-2080 m), 3258 (COL) (alt. 1750-2080 m), van der Hammen 493 (COL), Arbelaez s.n. (1932) (COL), Fernandez & Mora 1331 (COL) (alt. 1300 m), Fernandez & Perez-Arbelaez 454 (COL) (alt. 1000-1300 m), Idrobo & Hernandez 1546 (COL) (alt. 1900-2100 m); Valle: Duque 992 (US) (alt. 1500 m); Cauca: Karsten s.n. (US), Jaramillo 992 (F) (alt. 1500 m); Tolima: Garcia-Barriga 12248 (US) (alt. 1580-1620 m), T. A. Sprague 274 (US); Huila: E. L. Little, Jr. 7294 (US), 8469 (US). Ecuador: Jose Marrero & E. L. Little, Jr. 6139 (US). Peru: San Martin: Ll. Williams 7782 (F); Cuzco: Vargas 11051 (US); Puno: Metcalf 30636 (A) (alt. 1000-1300 m). Bolivia: Santa Cruz: Cardenas 4055 (F) (Plaza Ancha, upper Rio Ichillo-Villagrande, alt. 1300 m), 4575 (US) (Cocotal-Chapare, alt. 1800 m).

Local names: Chocho or Rojizo or Peonia (Colombia), Surigay (Boyaca, Colombia).

Distribution: This species has a very extensive range at the higher elevations (mostly 1500-2000 m) in South America: Venezuela (Merida, Tachira and Lara); Colombia (Magdalena, Norte de Santander, Antioquia, Santander, Caldas, Valle, Cundinamarca, Boyaca, Cauca, Tolima and Huila); Ecuador (Imbabura); Peru (San Martin, Cuzco and Puno) and Bolivia (La Paz and Santa Cruz).

A specimen from a tree in cultivation was seen from Peredeniya, Ceylon.

38. Erythrina mexicana Krukoff, Brittonia 3:309. 1939.

Chromosome numbers: 2n = 42, voucher: Gieseman s.n. (Krukoff Herb. 15129) from Guatemala (6:409).

Mexico: Guerrero: Hinton 14708; Veracruz: Mario Souza 2850 (MEXU), Ross 209 (US); Oaxaca: Schultes & Reko 687 (Tuxtepec), 952 (Choapam), Carlson 2737 (F), Matuda 32247 (US); Chiapas: Matuda 17601, 7247 (MEXU). Guatemala: Quezaltenango: Steyermark 52127 (alt. 850 m); Suchitepequez: Krukoff 67-2 (near Chicacao, Finca Naranjo), Steyermark 46733 (Volcan Santa Clara, 1250-2560 m); Solola: above finca Moca (alt. 1250-1400 m); Steyermark 48032.

Local names: Colorin or Sompantle (Oaxaca), Ma-nya (by the Chinantecs in Oaxaca), Betutsa-gitse (by the Zapotecs in Oaxaca), Simpante (Chiapas), Ermitche (San Marcos, Guatemala).

Distribution: Mexico (San Luis Potosi, Mexico, Guerrero, Veracruz, Oaxaca and Chiapas), Guatemala (Alta Verapaz, San Marcos, Quezaltenango, Suchi-

tepequez and Solola) and Nicaragua (Granada).

According to Schultes this species is the commonest species of the genus in the districts of Tuxtepec and Choapam in Oaxaca.

39. Erythrina lanceolata Standley, Contr. U.S. Nat. Herb. 17:432. 1914.

Chromosome numbers: 2n = 42, voucher: Lancaster s.n. (Krukoff Herb. 15377) from Costa Rica (6:409).

Country undesign.: Commerson s.n. (F). U.S.: California: Los Angeles (cult.), Westcott 210 (F). Honduras: Santa Barbara: L.O. Williams & Molina 14511 (EAP); Morazan: Molina 2956 (F); El Paraiso: Juvenal Valerio 186D (EAP) (alt. 1400 m). Nicaragua: Matagalpa: Cordill. Central de Nicaragua (alt. 1300 m), L.O. Williams 23670 (F) (fl. Jan.). Costa Rica: Pittier 6893 (BR), G.C. Worthen s.n. (M); Guanacaste: L.O. Williams et al. 26627 (F) (fl. Jan.) (alt. 800 m); Alajuela: Brenes 826 (W) 21824; San Jose: J.A. Echeverria 365 (CR) (Tablazo), Mus. Nac. Costa Rica 31220 (CR) (San Cristobal de Candelaria); Cartago: Jorge Leon 4576 (EAP) (alt. 1330 m).

Distribution: This species has a rather extensive range at higher elevations (mostly 1000-1800 m) in Central America. In Honduras it is known from Santa Barbara, Cortes, Comayagua, Yoro, Morazan, and El Paraiso; in Nicaragua from Matagalpa; in Costa Rica from Guanacaste, Puntarenas, Alajuela, San Jose and Cartago.

40. Erythrina hondurensis Standley, Field Mus. Publ. Bot. 4:309. 1929.

Guatemala: Izabal: Steyermark 39080 (F) (Montana del Mico, alt. 35-150 m), 41776 (F) (along Rio Tamaya, alt. 50 m), Raven & Gregory 606 (US). Honduras: Atlantida: Molina 10337 (EAP) (alt. 100 m); Cortes: L.O. Williams 17831 (EAP) (alt. 550 m). Nicaragua: Zelaya: Long 160 (F).

Distribution: Guatemala (Izabal), Honduras (Atlantida and Cortes) and Nicaragua (Zelaya). This is a lowland species.

41. Erythrina gibbosa Cufodontis, Arch. Bot. Sist. Fitog. & Genet. 10:34. 1934.

Honduras: Olancho: vicin. Catacamas (450-500 m), Standley 18386 (F). Costa Rica: Alajuela: Mus. Nac. Costa Rica 17699 (CR) (San Ramon, alt. 1400-1600 m), Quiroz 286 (CR) (La Palma de San Ramon), Austin Smith 2771 (F) (Alfaro Ruiz, alt. ± 1700 m), Brenes 828 (W), 4544 (F), 9767 (near San Ramon); Cartago: Reark 640 (EAP) (alt. 1400 m), Jorge Leon 4576 (TURIA), (Las Concavas, alt. 1330 m); Limon: Shark & Molina 4289 (EAP) (alt. 0 m). Panama: Bocas del Toro: H. von Wedel 1196 (US) (fl. Oct.); Cocle: Dwyer 1839A (US), Allen 2714 (M) (El Valle de Anton, alt. 1000 m), 3622(GH), Duke 13232 (alt. 700 m).

Local names: Gualiqueme (Honduras), Poro de la montana (Costa Rica).

Distribution: At moderately high elevations in Honduras (Olancho), Costa Rica (Alajuela, Limon, San Jose and Cartago) and Panama (Bocas del Toro, Chiriqui and Cocle).

The collector notes on the label (Allen 2714): "the common Erythrina of the entire El Valle de Anton region."

43. Erythrina costaricensis M. Micheli, Bull. Herb. Boiss. 2:445. 1894.

Erythrina panamensis Standley, Jour. Wash. Acad. 17:10. 1927.

Erythrina colombiana Krukoff, Brittonia 3:325. 1939.

Costa Rica: Guanacaste: Herb. Pittier 6781 (CR)(Punta Mala, litoral de Pacifico), Oton Jimenez 1244 (CR)(Golfo de Nicoya); San Jose: Stork 3112 (MICH), Jorge Leon 1044 (CR)(Valle del General, alt. 600-700 m), Kohkemper 692 (EAP); Puntarenas: Molina et al. 18175 (F)(fr. March)(vicin. San Isidro El General), L.O. Williams et al. 28762 (F)(along Rio Sonador, alt. 600 m), Manuel Valerio 473 (CR)(Golfo Dulce), Allen 5722 (F)(Palmar Norte de Osa);

Cartago: Cordoba 367 (M), Krukoff 67-4, 67-5(near Turrialba in fences); Limon: Talamanca Mnts.: Paul Shank 9 (EAP) (alt. 300 m). Panama: Bocas del Toro: Kirkbride & Duke 458 (M), Lewis et al. 875 (M); Canal Zone: Tyson 1447 (M), Blum & Tyson 2001 (M), Steyermark & Allen s.n. (EAP) (alt. 70-80 m), Killip 39975 (US) (alt. 200-300 m), 40036 (US), Frost s.n. (March 20, 1929) (F), Duke 4382 (M), Harvey 5014 (F) (fl. Nov.), Correa & Haines 484 (M), Copenheimer 1415 (M), Croat 8286 (M), 8476 (M), 8490 (M), 8560 (M), 8625 (M), Panama: Duke 8398, 14502; Darien: Shurcliff et al. 633 (M), Kirkbride & Duke 1130 (M). Colombia: Valle: Guatemasas 45285 (US); Antioquia: Uribe-Uribe 1162 (alt. 500 m) (COL), Feddema 1913 (alt. 100 m) (US), Lopez & Sanchez 18 (alt. 150 m) (US); Boyaca: El Humbo, A.E. Lawrence 618 (type coll. of E. colombiana).

Distribution: Costa Rica (Guanacaste, Puntarenas, San Jose, Cartago and Limon), Panama (Chiriqui, Bocas del Toro, Canal Zone, Panama and Darien) and Colombia (Choco, Antioquia, Valle and Boyaca).

Abundant new collections cited in this paper show that E. panamensis cannot be maintained as a distinct species. On an examination of a sheet of the type collection of E. colombiana deposited with Arnold Arboretum, which consists of flowers as well as leaves, it became evident that it also cannot be maintained as a distinct species. In 1939 when E. colombiana was described, only two sheets deposited at U.S. National Herbarium and the New York Botanical Garden were available and they consist of flowers only.

E. costaricensis is rather uniform in its characters as it occurs in Panama and in the valley of Rio General (provinces San Jose and Puntarenas) Costa Rica. It shows considerable variations in its characters in other parts of Costa Rica. In some of these regions also occurs the related E. berteroana, perhaps the most variable Erythrina in America. The two may be easily separated if the characteristic pubescence of mature or almost mature leaflet blades beneath (pubescent, often lanate, with long villous whitish deciduous hairs) of E. costaricensis is not lost. Otherwise their separation becomes difficult and it is often necessary to use a combination of several characters. The following characters should be observed. Terminal leaflet-blades of E. costaricensis are usually longer than broad and are acuminate at the apex (they are often broader than long and usually acute at the apex in E. berteroana). Calyces of E. costaricensis are usually about as long on the carinal as on the vexillar side and irregularly lobed at margin (they are usually much longer on the carinal than on the vexillar side in E. berteroana), and the flower-buds are broader and round at the apex. Pods of E. costaricensis are moniliform and usually densely pubescent, remnants of pubescence remaining in part toward maturity, and the seeds are uniformly scarlet (those of E. berteroana usually have a black line extending from the hilum for approximately 1 mm toward the chalazal end).

44. Erythrina folkersii Krukoff & Moldenke, Phytologia 1:286. 1938.

Chromosome numbers: 2n = 42, voucher: Cons. Forests s.n. (tree #10) from Belize (this voucher was identified by me) (6:408).

Mexico: Veracruz: Gomez & Riba 238 (MEXU), L. Gonzalez C. 2211 (ENCB) (fl. March, no leaves), Vera Santos 2777 (MICH) (Palmar); Oaxaca: Martinez-Calderon 51 (A). Guatemala: Alta Verapaz: vicinity of Cubilguitz, Steyermark 44644 (alt. 350-450 m).

Distribution: Southern Mexico (basin of Coatzacoalcos River in the states of Oaxaca and Veracruz and the State of Chiapas), throughout and in eastern Guatemala (departments of Alta Verapaz and Izabal). This is a lowland species.

According to Ll. Williams, often grown in Mexico for fence posts and as a shade for cacao and coffee.

45. Erythrina macrophylla De Candolle, Prodr. 2:411. 1825.

Chromosome numbers: 2n = 42, voucher: Armstrong 48 from Guatemala, Quezaltenango (this voucher was identified by me) (6:409).

Guatemala: Huehuetenango: Steyermark 48971 (F) (alt. 1500-1600 m), 49768 (F) (alt. 2500 m), 51871 (F) (alt. 1500-2500 m), Breedlove 11670 (US) (alt. ± 3000 m); Quiche: west of Chichicastenango, Molina et al. 16137; Quetzaltenango: Standley 83924 (F) (alt. 2150-2300 m), 84802 (F) (alt. 2250-2400 m); Chimaltenango: Molina et al. 16137 (Tecpan, alt. 2550 m), Barbara Sprosz 1 (F), Standley 80139 (F), 80118 (F) (alt. 2250-2400 m), 83173 (F) (alt. 2250 m); Guatemala: Standley 80516 (F) (alt. 1800-2300 m). El Salvador: San Salvador: Carlson 420 (F) (alt. 1680-1890 m), Allen 7193 (F) (alt. 1500-2000 m). Honduras: Intibuca: Standley 25324 (EAP).

Local names: Miche (Huehuetenango, Guatemala); Pito de montana or Ajuijote (El Salvador).

Distribution: At higher elevations in Guatemala (Huehuetenango, Quezaltenango, Solola, Quiche, Chimaltenango, Guatemala and Sacatepequez), El Salvador (San Salvador) and Honduras (Intibuca).

A specimen from a tree in cultivation was seen from Sao Paulo, Brazil.

46. Erythrina cochleata Standley, Contr. U.S. Nat. Herb. 20:179. 1919.

Costa Rica: Alajuela: San Carlos, Quebrada de Palo, alt. 625 m, Austin Smith 1940 (M), Cartago: Anastasio Alfaro 5 (F), 6 (GR), 7 (F), (La Fuente Peralta, alt. 1300 m), Jorge Leon 1524 (TURIA) (Turrialba, La Isabel) (alt. 650 m).

Anastasio Alfaro's specimens were collected near the divide between the Pacific and Atlantic watersheds.

Distribution: Known only from eastern Costa Rica (Alajuela, Cartago and Limon) and central Colombia (Caldas). Further collections are needed to establish its range.

47. Erythrina chiriquensis Krukoff, Brittonia 3:322. 1938.

Costa Rica: Cartago: Finca Las Quinas, San Antonio, Turrialba, Krukoff 7a. Panama: Chiriqui: Tyson 872 (M) (alt. 2100 m), Stern & Chambers 81 (M), Allen 3474 (vicin. of Cerro Punta, alt. 2000 m), 4757 (GH), Butcher s.n. (March 10, 1968) (alt. 6000 ft.).

Distribution: At higher elevations in Costa Rica (Cartago) and Panama (Chiriqui).

48. Erythrina smithiana Krukoff, Brittonia 3:323. 1939.

Ecuador: Guayas (alt. 40 m): Camp E-3623, Carlos Jativa & Carl Epling 925 (US)(fl. Aug.), Fagerlind & Wilson s.n. (23/9-1952) (S), 243 (S); Los Rios: E.L. Little, Jr. 6489 (US), Acosta Solis 10833 (F), Carlos Jativa & Carl Epling 932 (US)(fl. July)(alt. 70 m), Harling 260 (S)(alt. 30 m), 431 (S)(alt. 30 m)(fl. red), Sparre 17980 (S)(alt. 20 m)(fl. flame red); Bolivar: Acosta Solis 6025 (F)(1270 m); Chimborazo: Acosta Solis 5225 (as to fl.)(F), Harling 6047 (S)(fl. red), Asplund 15506 (S)(alt. 1100 m); El Oro: E.L. Little, Jr. 6717 (US), 6727 (US), A.J. Gilmartin 758 (US); Loja: Steyermark 54359 (F)(alt. 1520 m). Peru: Pavon s.n. (G), 749 (G).

Local names: Porotillo (Los Rios, Loja).

Distribution: Ecuador (Guayas, Los Rios, Bolivar, Chimborazo, El Oro and Loja). Specimens from Colombia (El Valle) and Peru were placed here with doubts.

Apparently cultivated for live hedges in Bolivar, Ecuador (Acosta Solis 6025). Flowers are described as "rojas" (Acosta Solis 6025), "deep scarlet-red" (Steyermark 54359), "crimson" (Camp E-3623), and "flame red" (Sparre 17980).

X. Variegatae

50. Erythrina velutina Willdenow, Ges. Nat. Freunde Berlin Neue Schr. 3: 426. 1801.

Chromosome numbers: 2n = 42, voucher: Sobrinho s.n. (Krukoff Herb. 9263); 2n = 42, voucher not seen: Servico Forestal s.n. (USDA plant introduction number 150394) from Brazil (6:409).

St. Thomas: Ledru s.n. (FI). Dominican Republic: Bro. Basilio A. Lavastre 2075. Haiti: Ekman, H 8221. Antigua: Box 1410 (US). Grenada: Howard 10960. Curacao: Bro. M. Arnaldo 1613 (US). Colombia: Magdalena: Castaneda s.n. (Febr. 1948), T. Hanbury-Tracy 287 (US), Pater C. Vogl 523 (US), Romero-Castaneda 792 (COL); Guajira: Dugand 6629 (COL), Saravia & Johnson 95 (COL), 402 (COL), Romero-Castaneda 4503 (COL). Ecuador: foot of Cerro Monte Cristo, N.W. corner: A.J. Gilmartin 772 (US); Manabi: Acosta Solis 10669 (F), Carlos Jativa & Carl Epling 496 (US), Oscar Haught 3505 (US). Peru: Ellenberg 1403 (J)(Cienega S. von Zorritos); Lambayeque: Hutchison 1368. Venezuela: Brother Elias s.n., Steyermark 62347 (M); Carabobo: Saer d'Hegguert 839, 840; Aragua: Burkart 16176 (VEN)(fr. March), 16180 (VEN)(fl. March); Federal District: Killip 37730 (US), Aristiguieta 1997 (VEN)(fr. Sept.); Guarico: Aristiguieta 6040 (VEN)(fl. March), 6074 (VEN)(fr. March), Tamayo 3379 (VEN)(fr. March); Sucre: Steyermark 62347 (F); Anzoategui: Foster D. Smith 42 (US), E.L. Little, Jr. 16057 (VEN)(fl. Dec.). Brazil: J.B.R.J. 57602 (RB); Piaui: Theresina, Lacke s.n. (July 4, 1907) (PG), J.B.R.J. 11959 (RB); Ceara: Huber s.n. (PG), Cutler 8239 (US); Paraiba: Acude do Gurjao, J.B.R.J. 93592 (RB); Pernambuco: Recife, Vasc. Sobrinho 899 (IAN), Lima 50-669 (PERN), Pickel 1219 (PERN); Bahia: Veloso 1 (US), Pereira 2156, J.B.R.J. 95980 (RB), 129817 (RB)(Palmeira para Santo Soares), 132260 (RB)(Milagres); Minas Geraes: Mendes Magalhaes 6105 (RB)(Lagoa Grande, Caatinga), s.n. (10/10-1950)(UB); Rio Janeiro and Guanabara: Constantino s.n. (Sept. 1924), da Silva s.n. (Sept. 20, 1945), Luiz Emygdio 2133 (R), J.B.R.J. 19117 (RB) (Lagoa, cult.), 16563 (RB)(Jard. Bot. cult.), 41468 (RB)(Jard. Bot. cult.), 24390 (RB)(Jard. Bot. cult.), Pabst 5693 (HB) (near Itanhangra Golf Club); Sao Paulo: Inst. Bot. Sao Paulo 37001 (SP) (Jard. Bot. Sao Paulo, cult.), 53066 (SP)(Jard. Bot. Sao Paulo, cult.); Fernando de Noronha: Lima 55-2182 (PERN), 55-2254 (PERN).

Local names: Pionia (Guajira, Colombia).

Distribution: Apparently confined to the drier tropics in the West Indies, northern Venezuela and northern Colombia, reappearing on the Pacific coast of South America in Ecuador (incl. the Galapagos Islands) and Peru, and on the Atlantic coast in Brazil from Piaui to Sao Paulo.

In the West Indies it has been collected in Cuba (Habana), Jamaica, Gran Cayman, Haiti, Dominican Republic, St. Thomas, Antigua, Grenada, Tobago, Trinidad, Curacao and Aruba.

In South America it has been collected in Colombia (Goajira, Magdalena), Venezuela (Falcon, Carabobo, Aragua, Federal District, Guarico, Miranda, Sucre and Anzoategui), Ecuador (Manabi, Guayas and the Galapagos Islands), Peru (Lambayeque) and Brazil (Piaui, Ceara, Paraiba, Pernambuco, Bahia, Minas Geraes, Rio de Janeiro, Guanabara and Sao Paulo).

Specimens from trees in cultivation were seen from Bermuda, Bahamas, Martinique, Guatemala, Surinam, Brazil (Amazonas) and Paraguay.

Of the American species only E. glauca has a more extensive range than E. velutina. These two species and E. berteroana are the only ones which occur both in the West Indies and in South America.

The collector notes on the label (Box 1410 from Antigua): "There are probably less than half a dozen of these trees in the Island growing apparently wild in the higher parts of the central region." This specimen approaches E. grisebachii, as does Luiz Emygdio 2133 from Rio de Janeiro.

50a. Erythrina velutina fma. aurantiaca (Ridley) Krukoff, Brittonia 3:329. 1939.

Brazil: Fernando de Noronha: Lima 55-2255 (PERN).

Distribution: Fernando de Noronha and State of Ceara, Brazil.

Altogether I have studied more than 133 collections of E. velutina and 27 collections of E. grisebachii, many of which have seeds. All seeds examined are uniformly red. E. velutina fma. aurantiaca (with seeds blackish except for a red band around hilum) apparently is rare as it has been collected only on three occasions on the island of Fernando Noronha, and on four occasions in Ceara, Brazil. This statement is backed by the observations of Lima who collected typical E. velutina as well as E. velutina fma. aurantiaca on the island of Fernando Noronha in November, 1955. According to Lima, E. velutina fma. aurantiaca is rare on the island, whereas typical E. velutina is frequent.

51. Erythrina grisebachii Urban, Symb. Ant. 9:453. 1928.

Chromosome numbers: 2n = 42, voucher not seen: Walsingham s.n. from Cuba, Atkins Gard.&Research Lab. I accept the identification by Walsingham without reservations as he knew this species and sent me seeds and specimens of it on several occasions (Krukoff Herb. 9134, 9316, 9439 and 9898) (6:408).

Cuba: Roble 1840; Habana: Bro. Leon 14786 (GH).

Distribution: Endemic to Cuba (Pinar del Rio, Habana, Matanzas, Las Villas and Oriente).

In 1939 I stated: "I retain Urban's species for the time being, but field studies may prove that it is better regarded as a variety or an ecological form of E. velutina" (1:331). Since then no progress has been made on the problem, and a trip to Cuba to examine these two entities in the field presently is out of question.

Doubtful species and species excluded from the genus

Twenty-five species either doubtful or excluded from the genus were discussed in the monograph (1:331-336). Subsequently my disposal of three of these, all based originally on cultivated plants of unknown geographic origin, have been confirmed:

3. Erythrina constantiana Micheli, Rev. Hortic. 68:524. 1896.

In 1939 I stated that this wasobviously an African plant, probably conspecific with E. caffra Thunb. It has since been placed in synonymy under this species by McClintock in 1953 (44:56).

9. Erythrina insignis Todaro, Nuovi Gen. 66. 1861.

In 1939 I stated (1:333): "It is obviously a South African plant". Collett (40:223) placed it in synonymy under E. caffra Thunb. in 1941.

25. Erythrina viarum Todaro, Nuovi Gen. 62. 1861.

In 1939 I suggested that this was a South African plant (1:336) and in 1941 Collett placed it in synonymy under E. caffra Thunb. (40:223).

Asiatic-Polynesian and African species cultivated in America

Asiatic-Polynesian species

1. Erythrina variegata L.

This species is widely grown in America, especially in the West Indies. I have seen specimens from the U.S. (Florida and California), Cuba, Jamaica, Hispaniola (Hai'i and Dominican Republic), Puerto Rico, Tortola, St. Croix, St. Martin, Guadeloupe, Martinique, Canouan, Belize, Guiana, and Brazil (Rio de Janeiro and Sao Paulo). It was introduced to America before 1825 as shown by the fact that it was described by Alph. De Candolle under the name E. divaricata (2:226).

2. Erythrina subumbrans (Hasskarl) Merrill is grown in Surinam.

I have seen botanical specimens or actual plants of the following species which are in cultivation in California:

3. Erythrina arborescens Roxburgh
4. Erythrina fusca Loureiro (=Erythrina ovalifolia Roxb.)
5. Erythrina tahitensis Nadeau (=Erythrina indica Lam.)
6. Erythrina vespertilio Bentham

African species

I have seen botanical specimens or actual plants of the following species which are in cultivation in California:

7. Erythrina acanthocarpa E. Meyer
8. Erythrina caffra Thunberg (also in Bermuda)
9. Erythrina humeana Sprengel
   also Erythrina humeana var. raja (Meissn.) Harvey
10. Erythrina latissima E. Meyer
11. Erythrina lysistemon Hutchinson
12. Erythrina zeyheri Harvey

Of these the most commonly cultivated are Erythrina caffra and Erythrina humeana.

13. Erythrina abyssinica Lamarck ex De Candolle is grown in Cuba (Habana).

14. Erythrina senegalensis De Candolle is grown in Cuba (Habana and Las Villas) and in Brazil (Rio de Janeiro and Guanabara, Sao Paulo and Campinas).

Appendices

In Appendix I are listed species as they are presently recognized by me; also species which were described as new, and/or reduced to synonymy, since my monograph appeared in 1939. This list will be helpful to a future monographer of the genus and in identification of specimens.

In Appendix II species are grouped under the authors of the species.

In Appendix III species are grouped under the collectors of the type specimens.

In Appendix IV species are grouped under the countries of origin of the type specimens.

In Appendix V species are grouped by the countries where they are found. This information will be helpful for regional floras and as a short-cut in identifications.

In Appendix VI are given statistical data on distribution of the species in various countries.

In Appendix VII are listed species of which leaves and/or flowers and/or fruits are still unknown. This will be helpful to collectors and a future monographer of the genus.

In Appendix VIII are listed references to illustrations which are very helpful in identification of specimens. In the genus Erythrina they are much better than descriptions.

In Appendix IX are listed chromosome numbers published for American species of Erythrina. More detailed information on this is given under respective species. An effort was made to trace, as far as possible, the real identity and the origin of plants from which chromosome numbers were determined. This applies to Erythrina species listed in Appendix IX as well as in Appendix X.

In Appendix X are listed chromosome numbers published for Asiatic-Polynesian and Australian species of Erythrina.

In Appendix XI are listed chromosome numbers published for African species of Erythrina.

In Appendix XII are given statistical data on the specimens which were examined and cited in the monograph and its

supplements. These data give information at a glance as to which species are poorly collected and require further collecting.

In Appendix XIII are given changes in the identifications of specimens.

In Appendix XIV are given citations of places of deposit of specimens in this and other serial papers on Erythrina.

Appendix I

List of Known American Species of Erythrina

I. Fuscae
1. glauca

II. Cristae-galli
2. crista-galli
3. falcata

III. Vernae
4. poeppigiana
5. ulei
6. dominguezii
7. verna
8. flammea

IV. Speciosae
9. speciosa

V. Edules
10. polychaeta
11. schimpffii
12. edulis

VI. Leptorhizae
13. breviflora
13a. " fma. petraea
13b. " fma. oaxacana
14. leptorhiza
15. horrida

16. montana

VII. Corallodendra
17. peruviana
18. pallida
19. mitis
20. buchii
21. leptopoda
21a. elenae (reviewed in 3rd. suppl.)
22. eggersii
23. amazonica
24. similis
25. corallodendrum var. coralloderdrum
25a. " var. bicolor
25b. " var. connata

VIII. Cubenses
26. cubensis
26a. oliviae (described in 3rd suppl.)

IX. Herbaceae
27. herbacea
28. coralloides
29. flabelliformis
30. lanata
32. berteroana
32a. guatemalensis (described in 1st. suppl.; 2:688)
33. americana
34. standleyana
35. chiapasana
36. goldmanii
37. rubrinervia
38. mexicana
39. lanceolata
40. hondurensis
41. gibbosa
43. costaricensis
44. folkersii

45. macrophylla
46. cochleata
47. chiriquensis
48. smithiana

X. Variegatae
50. velutina
50a. velutina fma. aurantiaca
51. grisebachii

Species reduced to synonmy since the monograph (1939).

E. occidentalis Standley was reduced to synonmy under E. lanata Rose whereas E. panamensis Standley and E. colombiana Krukoff - under E. costaricensis M. Micheli, all in 3rd supplement.

Appendix II

Authors of the species

Andrews, H.	- speciosa (1).
Bentham, G.	- falcata (1).
Britton, N.L. & J.N. Rose	- pallida (1).
Cook, O.F. (orig. described by W.G. Walpers)	- poeppigiana (1).
Cufodontis, G.	- gibbosa (1).
De Candolle, Alph.	- breviflora, leptorhiza, horrida coralloides, macrophylla (5).
Diels, L.	- schimpffii (1).
Harms, H.	- ulei, polychaeta (2).
Hassler, E.	- dominguezii (1).
Herzog, Th.	- flammea (1).
Howard, R.A. & W. Briggs	- elenae (1).
Humboldt, F.H.A., A.J.A. Bonpland & C.S. Kunth	- rubrinervia (1).
Jacquin, N.J. von	- mitis
Kearney, T.H.	- flabelliformis (1).

Krukoff, B.A.	- breviflora fma. petraea, breviflora fma. oaxacana, peruviana, amazonica, similis, corallodendrum var. bicolor, corallodendrum var. connata, oliviae, guatemalensis, standleyana, chiapasana, mexicana, chiriquensis, smithiana, velutina fma. aurantiaca (orig. described by H.N. Ridley). (10 + 5)
Krukoff, B.A. & H.N. Moldenke	- eggersii, folkersii (2).
Linnaeus, C.	- crista-galli, corallodendrum var. corallodondrum, herbacea (3).
Miller, P.	- americana (1).
Micheli, M.	- costaricensis (1).
Rose, J.N.	- lanata (1).
Rose, J.N. & P.C. Standley	- montana (1).
Standley, P.C.	- goldmanii, lanceolata, hondurensis, cochleata (4).
Triana, J.J.	- edulis (1).
Urban, I.	- buchii, berteroana, grisebachii (3).
Urban, I. & E.L. Ekman	- leptopoda (1).
Velloso, J.M.	- verna (1).
Willdenow, C.L.	- glauca, velutina (2).
Wright, C.	- cubensis (1).

Appendix III

Collectors of the type specimens

Bartlett, H.H.	- folkersii (1).
Bertero, C.G.	- berteroana (1).
Bredemeyer, F.	- glauca, velutina (2).

Brenes, A.M. - gibbosa (1).
Britton, N.L. - pallida (1).
Britton, N.L. & E.G. Britton - corallodendrum var. connata (0 + 1).
Britton, N.L., P. Wilson & A.D. Selby - standleyana (1).
Buch, W. - buchii (1).
Converse, O.L. - oliviae (1).
Ekman, E.L. - leptopoda, grisebachii (2).
Goldman, E.A. - chiapasana, goldmanii (2).
Hassler, E. - similis (1).
Herzog, Th. - flammea (1).
Hinton, G.B. - mexicana (1).
Houstoun, W. - americana (1).
Howard, R.A. et al. - elenae (1).
Humboldt, F.H.A. & A.J.A. Bonpland - rubrinervia (1).
Jorgensen, P. - dominguezii (cotype) (1).
Krukoff, B.A. - amazonica (1).
Lampert, A.B. - speciosa (1).
Martius, C.F.P. von - falcata (1)
Palmer, E. - lanata (1)1
Pittier, H. - costaricensis (1).
Poeppig, E.F. - poeppigiana (1).
Purpus, C.A. - breviflora fma. petraea (0+1).
Ridley, H.N., Lea & Ramage - velutina fma. aurantiaca (0+1).
Rimbach, A. - polychaeta (1).
Rojas, T. - dominguezii (cotype) (1).
Rose, J.N. - montana (1).
Rose, J.N. & G. Rose - smithiana (1).
Schimpff, H.J.F. - schimpffii (1).
Sesse, M. & J.M. Mocino - breviflora, leptorhiza, horrida, coralloides (4).
Shafer, J.A. - corallodendrum var. bicolor (0+1).
Smith, L.C. - breviflora fma. oaxacana (0+1).
Standley, P.C. - guatemalensis, hondurensis (2).

Tessman, G.	- peruviana (1).
Tonduz, A.	- cochleata (1).
Triana, J.J.	- edulis (1).
Ule, E.H.G.	- ulei (1).
Werkle, C.	- lanceolata (1).
White, G. & P. White	- chiriquensis (1).
Wilcox, T.E.	- flabelliformis (1).
Wright, C.	- cubensis (1).
collector undesignated	- crista-galli, verna, mitis, eggersii, corallodendrum var. corallodendrum, herbacea, macrophylla (7).

Note : Types probably do not exist and/or were not designated for 14 species: glauca, crista-galli, verna, speciosa, breviflora, leptorhiza, horrida, mitis, eggersii, corallodendrum var. corallodendrum, cubensis, herbacea, coralloides, and velutina.

Appendix IV

Countries of origin of the type specimens

U.S.A.	: herbacea, flabelliformis (2).
Cuba	: elenae, cubensis, standleyana, grisebachii (4).
Jamaica	: corallodendrum var. corallodendrum (1).
Haiti	: buchii, leptopoda (2).
St. Thomas	: corallodendrum var. connata (0+1).
St. Croix	: eggersii (1).
Montserrat	: corallodendrum var. bicolor (0+1).
Trinidad	: pallida (1).
Mexico	: breviflora, breviflora fma. petraea, breviflora fma. oaxacana, leptorhiza, horrida, montana, oliviae, coralloides, lanata, americana, chiapasana, goldmanii, mexicana (12+2).

Belize : folkersii (1).
Guatemala : guatemalensis (1).
Honduras : hondurensis (1).
Costa Rica : lanceolata, gibbosa, costaricensis, cochleata (4).
Panama : chiriquensis (1).
Colombia : edulis, berteroana, rubrinervia (3).
Venezuela : glauca, mitis, velutina (3).
Ecuador : polychaeta, schimpffii, smithiana (3).
Peru : poeppigiana, ulei, peruviana (3).
Brazil : crista-galli, falcata, verna, amazonica, velutina fma. aurantiaca (4+1).
Bolivia : flammea (1).
Paraguay & Argentina : dominguezii (co-types), similis (2).
cultivated : speciosa (native to Brazil), macrophylla (native to Central America) (2).

Appendix V

List of species which are known to occur in various countries

U.S.A.: herbacea, flabelliformis (2). (crista-galli, falcata, americana cult.).
Bermuda: (crista-galli, corallodendrum var. corallodendrum, herbacea cult.).
Bahamas: (velutina cult.).
Cuba: glauca, elenae, cubensis, berteroana, standleyana, velutina, grisebachii (7). (crista-galli, poeppigiana, herbacea cult.).
Jamaica: glauca, corallodendrum var. corallodendrum, velutina (3). (crista-galli, poeppigiana cult.).
Haiti: buchii, leptopoda, corallodendrum var. corallodendrum, berteroana, velutina (5). (poeppigiana cult.).
Dominican Republic: glauca, berteroana (2). (poeppigiana cult.).

Puerto Rico: glauca, eggersii, berteroana (3). (poeppigiana cult.).

St. Thomas: eggersii, corallodendrum var. connata, velutina (2+1).

Vieques: eggersii (1).

St. Croix: corallodendrum var. connata (0+1).

Montserrat: corallodendrum var. bicolor (0+1).

Antigua: corallodendrum var. connata (?), velutina (1+1).

Guadeloupe: glauca, corallodendrum var. bicolor (1+1). (crista-galli, poeppigiana cult.).

Martinique: glauca, pallida (?), corallodendrum var. bicolor (2+1). (crista-galli. poeppigiana, velutina cult.).

Sta Lucia: corallodendrum var. corallodendrum (?), corallodendrum var. bicolor (1+1).

St. Vincent: glauca, pallida, corallodendrum var. bicolor (2+1).

Grenada: corallodendrum var. bicolor, velutina (1+1).

Trinidad and Tobago: glauca, pallida, velutina (3). (crista-galli, poeppigiana cult.).

Aruba: velutina (1).

Curacao: velutina (1). (corallodendrum var. corallodendrum cult.).

Mexico: breviflora, breviflora fma. petraea, breviflora fma. oaxacana, leptorhiza, horrida, montana, oliviae, herbacea, coralloides, flabelliformis, lanata, berteroana, americana, standleyana, chiapasana, goldmanii, mexicana, folkersii, macrophylla (17+2).

Central America:

Belize: standleyana, folkersii (2). (glauca cult.).

Guatemala: glauca, berteroana, guatemalensis, standleyana, chiapasana, mexicana, hondurensis, folkersii, macrophylla (9). (crista-galli, poeppigiana and velutina cult.).

El Salvador: glauca, berteroana, macrophylla (3). (poeppigiana cult.).

Honduras: glauca, berteroana, guatemalensis, lanceolata, hondurensis, gibbosa, macrophylla (7). (poeppigiana cult.).

Nicaragua: glauca, berteroana, mexicana, lanceolata, hondurensis, costaricensis (6). (poeppigiana cult.).

Costa Rica: glauca, berteroana, lanceolata, gibbosa, costaricensis, cochleata, chiriquensis, (7). (crista-galli and poeppigiana cult.).

Panama: glauca, poeppigiana, berteroana, gibbosa, costaricensis, chiriquensis (6).

South America:

Venezuela: glauca, poeppigiana, edulis, pallida, mitis, berteroana, rubrinervia, velutina (8).

Guiana: glauca, amazonica (2). (crista-galli cult.).

Surinam: glauca, amazonica (2). (poeppigiana, velutina cult.).

French Guiana: glauca, amazonica (2).

Colombia: glauca, poeppigiana, ulei, edulis, amazonica, berteroana, rubrinervia, cochleata, smithiana (?), velutina, (10).

Peru: glauca, falcata, poeppigiana, ulei, edulis, peruviana, amazonica, rubrinervia, smithiana (?), velutina (10). (crista-galli, speciosa cult.).

Ecuador: glauca, poeppigiana, ulei, polychaeta, schimpffii, edulis, peruviana, rubrinervia, smithiana, velutina (10).

Brazil: glauca, crista-galli, falcata, poeppigiana, ulei, dominguezii, verna, flammea, speciosa, amazonica, similis, velutina, velutina fma. aurantiaca (12+1).

Bolivia: glauca, crista-galli, falcata, poeppigiana, ulei, dominguezii, flammea, similis, rubrinervia (9).

Paraguay: crista-galli, falcata, dominguezii, similis (4). (velutina cult.).
Uruguay: crista-galli (1).
Argentina: crista-galli, falcata, dominguezii (3).

On a recent trip I have seen botanical specimens or actual plants of the following species which are in cultivation in California: E. poeppigiana (Walpers) O.F. Cook, E. speciosa Andrews, E. coralloides De Candolle, E. berteroana Urban, E. macrophylla De Candolle.

Appendix VI

Statistical data on species (and varieties and forms) known to occur in various countries

	Collected	Endemic
U.S.A.	2	-
West Indies	12 + 2	
Cuba	7	3
Jamaica	3	-
Haiti	5	2
Dominican Republic	2	-
Puerto Rico	3	-
Lesser Antilles	4 + 2	0 - 1
Trinidad and Tobago	3	-
Aruba and Curacao	1	-
Mexico	17 + 2	8 + 2
Central America	14	
Belize	2	-
Guatemala	9	-
El Salvador	3	-
Honduras	7	-
Nicaragua	6	-
Costa Rica	7	-
Panama	6	-

	Collected	Endemic
South America	22 + 1	
Venezuela	8	1
Guiana, Surinam and French Guiana	2	-
Colombia	10	-
Peru	10	-
Ecuado.	10	2
Brazil	12 + 1	2 + 1
Bolivia	9	-
Paraguay	4	-
Uruguay	1	-
Argentina	3	-

Appendix VII

List of species of which leaves and/or flowers and/or fruits are still unknown

	lvs.	flrs.	frts.
I. Fuscae			
1. glauca	+	+	+
II. Cristae-galli			
2. crista-galli	+	+	+
3. falcata	+	+	+
III. Vernae			
4. poeppigiana	+	+	+
5. ulei	+	+	+
6. dominguezii	+	+	+
7. verna	+	+	-
8. flammea	+	+	+
IV. Speciosae			
9. speciosa	+	+	+
V. Edules			
10. polychaeta	+	+	-
11. schimpffii	+	+	+

12. edulis	+	+	+
VI. Leptorhizae			
13. breviflora	+	+	+
13a. " fma. petraea	+	+	+
13b. " " oaxacana	+	+	-
14. leptorhiza	+	+	+
15. horrida	+	+	+
16. montana	+	+	-
VII. Corallodendra			
17. peruviana	+	+	+
18. pallida	+	+	+
19. mitis	+	+	+
20. buchii	+	+	+
21. leptopoda	+	+	+
21a. elenae	+	-	+
22. eggersii	+	+	+
23. amazonica	+	+	+
24. similis	+	+	-
25. corallodendrum var. corallodendrum	+	+	+
25a. " var. bicolor	+	+	+
25b. " " connata	+	+	-
VIII. Cubenses			
26. cubensis	+	+	+
26a. oliviae	+	+	+
IX. Herbaceae			
27. herbacea	+	+	+
28. coralloides	+	+	+
29. flabelliformis	+	+	+
30. lanata	+	+	+
32. berteroana	+	+	+
32a. guatemalensis	+	+	+
33. americana	+	+	+
34. standleyana	+	+	+

35. chiapasana	+	+	+
36. goldmanii	+	+	+
37. rubrinervia	+	+	+
38. mexicana	+	+	+
39. lanceolata	+	+	+
40. hondurensis	+	+	+
41. gibbosa	+	+	+
43. costaricensis	+	+	+
44. folkersii	+	+	+
45. macrophylla	+	+	+
46. cochleata	+	+	+
47. chiriquensis	+	+	+
48. smithiana	+	+	+
X. Variegatae			
50. velutina	+	+	+
50a. " fma. aurantiaca	+	+	+
51. grisebachii	+	+	+

Note

As seen from the above table, leaves and/or flowers and/or fruits of comparatively few species remain uncollected and unknown by comparison with other genera of more or less similar size and with a center of the distribution in the tropics.

Of 51 species (plus 2 varieties and 3 forms) known to date, flowers are not yet known of 1 species (E. elenae) and fruits and/or seeds of 4 species (and 1 variety and 1 form) (E. verna, E. polychaeta, E. breviflora forma oaxacana, E. montana, E. similis, and E. corallodendrum var. connata).

Appendix VIII

Illustrations

(To find the illustrations see a given reference, mostly the Monograph and/or Suppl. 1.)

I.	Fuscae	
	1. glauca	1:225; 2:684
II.	Crista-galli	
	2. crista-galli	1:229; 2:684
	3. falcata	---
III.	Vernae	
	4. poeppigiana	1:236
	5. ulei	2:684
	6. dominguezii	---
	7. verna	1:241
	8. flammea	---
IV.	Speciosae	
	9. speciosa	1:244; 2:684
V.	Edules	
	10. polychaeta	---
	11. schimpffii	2:684
	12. edulis	1:249
VI.	Leptorhizae	
	13. breviflora	1:255
	13a. " forma petraea	---
	13b. " " oaxacana	---
	14. leptorhiza	1:257
	15. horrida	1:259; 2:684
	16. montana	1:260
VII.	Corallodendra	
	17. peruviana	---
	18. pallida	---
	19. mitis	1:265; 2:684
	20. buchii	---
	21. leptopoda	---
	21a. elenae	---
	22. eggersii	1:269
	23. amazonica	---
	24. similis	---
	25. corallodendrum var. corallodendrum	1:273
	25a. " var. bicolor	1:276

25b. corallodendrum var. connata	---
VIII. Cubenses	
26. cubensis	2:686
26a. oliviae	---
IX. Herbaceae	
27. herbacea	1:283
28. coralloides	1:286; 3:53,54
29. flabelliformis	2:686
30. lanata	1:289
32. berteroana	---
32a. guatemalensis	---
33. americana	1:299
34. standleyana	2:686
35. chiapasana	---
36. goldmanii	---
37. rubrinervia	---
38. mexicana	2:686
39. lanceolata	---
40. hondurensis	---
41. gibbosa	---
43. costaricensis	1:316
44. folkersii	---
45. macrophylla	2:686
46. cochleata	---
47. chiriquensis	---
48. smithiana	---
X. Variegatae	
50. velutina	1:327; 2:686
50a. velutina fma. aurantiaca	1:329
51. grisebachii	---

Note

As seen from the above table the American species of Erythrina are well illustrated when compared with other genera of plants of more or less similar size and with a center of the distribution in the tropics.

Of 51 species (plus 2 varieties and 3 forms) known to date, 26 species (plus 1 variety and 1 form) were illustrated.

The most frequently illustrated species are E. crista-galli, E. herbacea, E. speciosa, E. corallodendrum and E. americana.

Appendix IX

Chromosome numbers in American species of Erythrina

(Numbers (2,3,4,and 5) in parenthesis indicate the number of determinations of chromosome numbers in different individual plants).

I.	Fuscae	
	1. glauca	2n = 42 (3)
II.	Cristae-galli	
	2. crista-galli	2n = 42 (5);(2n=40;44)
	3. falcata	2n = 42 (2)
III.	Vernae	
	4. poeppigiana	---
	5. ulei	---
	6. dominguezii	2n = 42
	7. verna	---
	8. flammea	---
IV.	Speciosae	
	9. speciosa	2n = 42
V.	Edulis	
	10. polychaeta	---
	11. schimpffii	---
	12. edulis	---
VI.	Leptorhizae	
	13. breviflora	---
	13a. " fma. petraea	---
	13b. " " oaxacana	---
	14. leptorhiza	---
	15. horrida	---

	16. montana	---
VII.	Corallodendra	
	17. peruviana	---
	18. pallida	2n = 42
	19. mitis	---
	20. buchii	2n = 42
	21. leptopoda	---
	21a. elenae	---
	22. eggersii	2n = 42
	23. amazonica	2n = 84
	24. similis	---
	25. corallodendrum var. corallodendrum	---
	25a. " var. bicolor	2n = 42
	25b. " var. connata	---
VIII.	Cubenses	
	26. cubensis	---
	26a. oliviae	---
IX.	Herbaceae	
	27. herbacea	2n = 42 (4);(2n=42)(2)
	28. coralloides	---
	29. flabelliformis	2n = 42 (2)
	30. lanata	---
	32. berteroana	2n = 42 (3); 2n=42
	32a. guatemalensis	2n = 42
	33. americana	2n = 42
	34. standleyana	2n = 42
	35. chiapasana	---
	36. goldmanii	2n = 42
	37. rubrinervia	2n = 42 (2)
	38. mexicana	2n = 42
	39. lanceolata	2n = 42
	40. hondurensis	---
	41. gibbosa	---
	43. costaricensis	---
	44. folkersii	2n = 42

45. macrophylla	2n = 42
46. cochleata	---
47. chiriquensis	---
48. smithiana	---
X. Variegatae	
50. velutina	2n = 42 (2)
50a. velutina fma. aurantiaca	---
51. grisebachii	2n = 42

Notes

Out of 51 species (plus 2 varieties and 3 forms) known to date, as shown by the above table, chromosome counts have been published for 23 (and 1 variety). Out of 10 species-groups the chromosome numbers are known for one or more species from 7 groups. No chromosome counts have been published for any species of the groups Edules, Leptorhizae and Cubenses.

A 2n number of 42 chromosomes was found in all sampled American species (21 species and 1 form) except E. amazonica which is tetraploid with 2n = 84. Three other species and one variety in the group Corallodendra, to which E. amazonica belongs, have 2n = 42, and it would be interesting to learn the numbers for 6 other species (and 1 variety) of this group.

The chromosome numbers of 8 species were determined two or more times from different individual plants. These determinations not only substantiate the original counts but also emphasize the absence of polyploid races within the species. The constancy of chromosome numbers in the genus seems to indicate that gene mutation rather than polyploidy is responsible for the diversity of species in Erythrina.

Appendix X

Chromosome numbers in Asiatic-Polynesian and Australian species of Erythrina

Asiatic - Polynesian species

I. Variegatae

1. E. variegata L. (= E. rostrata Ridley)
   Sundar Rao, Y., Jour. Indian Bot. Soc. 24: 42-44. 1945 (under the name "E. indica Lam"). — n-21; 2n=42
   (Krukoff Herb. s.n.) (6:408). — 2n = 42
   Nanda, P.C. Jour. Indian Bot. Soc. 41: 271-277. 1962 (under the name "E. indica Lam."). — n = 21
2. E. merilliana Krukoff
3. E. euodiphylla Hasskark
4. E. boninensis Tuyama
5. E. tahitensis Nadeaud (= E. sandwicensis Degener)

II. Subumbrantes

6. E. subumbrans (Hasskarl)Merrill

III. Fuscae

7. E. fusca Loureiro
   (Krukoff Herb. 9308 from Siam) (6:408). — 2n = 42
   Mehra, P.N. & A.C. Hans, Taxon 18(3): 314. 1969. — n = 21

IV. Arborescentes

8. E. arborescens Roxburgh
   Mehra, P.N. & A.C. Hans, Taxon 18(3): 314. 1969. — n = 21

V. Suberosae

9. E. suberosa Roxburgh
   (Kermode s.n. (Krukoff Herb. 9862 from Maymyo, Burma) (6:408). — 2n = 42
   Nanda, P.C. Jour. Indian Bot. Soc. 41: 271-277. 1962. — n = 21
   Mehra, P.N. & A.C. Hans, Taxon 18(3): 314. 1969. — n = 21

10. E. microcarpa Koorders & Valeton (=E. stipitata Merrill)
11. E. resupinata Roxburgh
12. E. stricta Roxburgh
13. E. mysorensis Gamble 2n=42
(coll. undesign. 253 from India) (6a:544).

Australian species

I. Variegatae
14. E. vespertilio Bentham 2n=42
(Trist s.n. (Krukoff 15004) from Australia (6:408).
15. E. insularis F.M. Bailey

VI. Phlebocarpae
16. E. phlebocarpa F.M. Bailey

Notes

Of 16 species known to date the chromosome numbers were published for 6 species belonging to 4 species-groups. No counts have been published for any species of groups Subumbrantes and Phlebocarpae.

A 2n number of 42 chromosomes was found in all sampled Asiatic-Polynesian and Australian species (6 species). It would be important to determine the chromosome numbers for some species of groups Subumbrantes and Phlebocarpae for which no counts are available.

Appendix XI

Chromosome numbers in African species of Erythrina

Tropical African species

1. E. abyssinica Lamarck ex De Candolle
(Gardner s.n. (Krukoff Herb. 9359) from Kenya 2n=42 (6:408).
2. E. burtii Baker fil.
(coll. undesign. 250 from Tanganyika) (6a:544). 2n=ca126

3. E. mildbraedii Harms (=E. altissima Chev.)
   Mangenot, S. & Mangenot, G. Bull. Gard. Bot. Etat Brux. 28: 315-329. 1958. 2n=42
4. E. senegalensis De Candolle
   (Belime s.n. (Krukoff Herb. 9350) from French West Africa) (6:408) 2n=42
   Miege, J., Rev. Cytol. & Biol. Veg. 24: 149-164. 1962 (Macina s.n. from Mali and Pont s.n. from Senegal). 2n=42
5. E. vogelii Hooker (=E. bancoensis Aubr. & Pell.)
   Mangenot, S. & Mangenot, G., Bull. Gard. Bot. Etat Brux. 27: 639-654. 1957. 2n=42

South African species

6. E. acanthocarpa E. Meyer
   (Everitt s.n. (Krukoff Herb. 15156) from South Africa (6:408) 2n=84
7. E. caffra Thunberg
   (Martley s.n. (Krukoff Herb. 9348) from South Africa) (6:408). 2n=42
8. E. humeana Sprengel (BEF. 10795-44) 2n=42
9. E. lysistemon Hutchinson
   Riley, H.P., Jour. S. Afr. Bot. 26: 37-44. 1960. (coll. undesign.; from Kruger National Park). 2n=42

Notes

Of approximately 32 known African species, the chromosome numbers have been published for 9 species. Atchison (6) in 1947 published counts for 5 species. From 1947 to 1966 the chromosome numbers of 4 additional species were published.

A 2n number of 42 chromosomes was found in all sampled African species (7 species) except E. acanthocarpa which is tetraploid with 2n = 84 and E. burtii which is hexaploid with 2n = ca 126. Additional determinations in African species would be of considerable interest.

Appendix XII

Collections cited in the monograph and its supplements

	Mono-graph 10/1939	Suppl. I 10/1941	Suppl. II 11/1943	Sub-total	Suppl. III	Tot.
I. Fuscae						
1. glauca	133	19	13	165	126	291
II. Crista-galli						
2. crista-galli	98	33	4	135	72	207
3. falcata	52	21	4	77	60	137
III. Vernae						
4. poeppigiana	100	12	10	122	68	190
5. ulei	15	2	--	17	7	24
6. dominguezii	11	1	3	15	4	19
7. verna	13	3	2	18	18	36
8. flammea(1 with doubts)	5	1	--	6	1	7
IV. Speciosae						
9. speciosa	17	10	1	28	31	59
V. Edules						
10. polychaeta	2	--	--	2	2	4
11. schimpffii	5	1	--	6	7	13
12. edulis(1 with doubts)	51	6	5	62	65	127
VI. Leptorhizae						
13. breviflora	22	3	3	28	30	58
13a. " fma. petraea	5	--	--	5	--	5
13b. " fma. oaxacana	3	--	--	3	--	3
14. leptorhiza	39	1	1	41	29	70
15. horrida	14	1	--	15	--	15
16. montana	7	--	1	8	11	19
VII. Corollodendra						
17. peruviana	1	--	--	1	3	4

	Mono-graph 10/1939	Suppl. I 10/1941	Suppl. II 11/1943	Sub-total	Suppl. III	Tot.
18. pallida (1 with doubts)	17	1	8	26	10	36
19. mitis (1 with doubts)	6	4	--	10	15	25
20. buchii	5	--	--	5	1	6
21. leptopoda	8	--	--	8	--	8
21a. elenae	--	--	--	--	2	2
22. eggersii	12	14	--	26	--	26
23. amazonica	6	7	2	15	14	29
24. similis	3	--	--	3	--	3
25. corallodendrum var. corallodendrum (2 with doubts)	9	2	--	11	7	18
25a. corallodendrum var. bicolor	12	5	1	18	7	25
25b. corallodendrum var. connata (1 with doubts)	9	1	--	10	--	10
VIII. Cubenses						
26. cubensis	33	6	1	40	5	45
26a. oliviae	--	--	--	--	2	2
IX. Herbaceae						
27. herbacea (2 with doubts)	86	35	8	129	99	228
28. coralloides (3 with doubts)	23	4	2	29	19	48
29. flabelliformis	61	27	2	90	67	157
30. lanata	12	2	1	15	42	57
32. berteroana (4 with doubts)	167	26	20	213	80	293
32a. guatemalensis	---	4	2	6	6	12
33. americana (7 with doubts)	45	11	6	62	20	82
34. standleyana	26	10	1	37	3	40

	Mono-graph 10/1939	Suppl. I 10/1941	Suppl. II 11/1943	Sub-Total	Suppl. III	Tot.
35. chiapasana	2	--	--	2	14	16
36. goldmanii	4	--	--	4	3	7
37. rubrinervia	27	6	2	35	40	75
38. mexicana(1 with doubts)	9	5	5	19	13	32
39. lanceolata	21	--	5	26	14	40
40. hondurensis	11	--	--	11	6	17
41. gibbosa	15	2	11	28	13	41
43. costaricensis (1 with doubts)	35	9	6	50	40	90
44. folkersii	30	2	--	32	5	37
45. macrophylla	10	3	1	14	17	31
46. cochleata	4	--	--	4	5	9
47. chiriquensis	1	4	--	5	6	11
48. smithiana (1 with doubts)	9	--	--	9	20	29
X. Variegatae						
50. velutina	58	13	1	72	61	133
50a. velutina fma. aurantiaca	3	3	--	6	1	7
51. grisebachii	23	2	--	25	2	27
TOTAL	1395	322	132	1849	1193	3042

From this appendix we arrive at the following statistics. At the time when the monograph was published in 1939 the average number of collections per entity amounted to 24.9 collections. It increased to 33 collections in 1943 at the time when Supplement II was published and to 54.3 collections in 1968.

Five species, namely E. berteroana, E. glauca, E. poeppigiana, E. herbacea and E. crista-galli are much more frequently collected than all others. Excluding these

five from our calculations, we arrive at the following statistics. The average number of collections per entity in 1939 amounted to 14.4 collections, in 1943 - to 19.3 collections and in 1968 - to 32.7 collections.

Due to the showy flowers and the fact that many species of Erythrina are grown in hedges for living fence-posts or for ornamental purposes, American Erythrinas are better collected than many other groups of plants from the tropics. We may also conclude that satisfactory progress in the collections of Erythrina was made since 1939. Among collections made since 1943, particularly notable are the extensive ones from Central America by Standley, Steyermark, Molina, and others connected with the Field Museum of Natural History, Chicago, and those from western middle Mexico by McVaugh and others connected with the University of Michigan.

Appendix XIII
Changes in the Identifications

	Cited originally as	Cited later as
Cook & Griggs 407	(?)macrophylla (1:320)	guatemalensis (4:689)
Krukoff 7a	costaricensis (5:637)	chiriquensis (3rd. suppl.)
Standley 65712	berteroana (4:688)	chiapasana (3rd. suppl.)

It should be noted also that inasmuch as E. occidentalis was reduced to synonymy under E. lanata, and E. panamensis and E. colombiana were reduced to synonmy under E. costaricensis, all specimens originally cited under the above referred to three names, were renamed.

Appendix XIV

Citations of places of deposit of specimens

The place of deposit of specimens is shown in this and my other papers on Erythrina by the following abbreviations:

A: Arnold Arboretum, Harvard University, Cambridge.***+
B: Botanisches Museum, Berlin-Dahlem. *
BHMG: Instituto Agronomico, Belo Horizonte. ** +
BL: Bailey Hortorium, Cornell University, Ithaca.*
BM: British Museum (Natural History), London. *** +
BRX: Jardin Botanique de l'Etat, Brussels. *** +
C: University of California, Berkeley. *
CAMP: Herbario do Instituto Agronomico do Estado de Sao Paulo, Campinas, Brazil. *
CAS: California Academy of Sciences, San Francisco. *
COL: Herbario Nacional Colombiano, Bogota. *** +
CR: Museo Nacional de Costa Rica, San Jose. *** +
CUZ: Universidad del Cuzco, Cuzco. *
D: Dudley Herbarium, Stanford University, Stanford.*
EAP: Escuela Agricola Panamericana, Honduras. ** +
EM: Escola Nacional Minas e Metal., Ouro Preto. ** +
ENCB: Instituto Politecnico Nacional, Mexico. ** +
ES: Estacion Experimental Agronomica, Habana. *
F: Field Museum of Natural History, Chicago. *** +
FI: Herbarium Universitatis Florentinae, Firenze. ** +
G: Conservatoire et Jardin Botanique, Geneve. *** +
GEORG: Georgetown Botanic Garden, Guiana. *
GH: Gray Herbarium, Harvard University, Cambridge. ***+
HAR: Botanical Museum of Harvard University, Cambridge. ***+
HB: Herbarium Bradeanum, Rio de Janeiro ** +
IAN: Instituto Agronomico do Norte, Para. ** +
INPA: Instituto Nacional de Pesquizas Amazonicas, Manaus. **+
K: Royal Botanic Gardens, Kew. *** +

LA: University of California, Los Angeles. *
LL: Lundell Herbarium, Renner. **
M: Missouri Botanical Garden, St. Louis. *** +
MD: Jardin Botanico, Madrid. *** +
MEXU: Herbario Nacional, Universidad Nacional, Mexico. ** +
MICH: University of Michigan, Ann Arbor. *** +
MUN: Botanisches Museum, Munchen. *** +
NY: New York Botanical Garden. *** +
OUPR: Escola de Farmacia, Ouro Preto, Brazil. ** +
P: Museum d'Histoire Naturelle, Paris. *
PERN: Instituto Pesquizas Agrononicas, Recife. ** +
PG: Museu Paraense Emilio Goeldi, Para. ** +
PH: Academy of Natural Sciences, Philadelphia. *
R: Museu Nacional, Rio de Janeiro. ** +
RB: Jardin Botanico, Rio de Janeiro. ** +
RO: Istituto Botanico, Citta Universitaria, Roma. ** +
RUEB: Geobotanisches Institut der E.T.H., Zurich. ** +
S: Naturhistoriska Riksmuseet, Stockholm. *** +
SP: Departamento de Botanica do Estado, Sao Paulo. *** +
TRIN: Trinidad Botanical Garden, Port of Spain. *
TURIA: Universidad de Turrialba, Costa Rica. ** +
U: Botanish Museum en Herbarium, Utrecht. ** +
UB: Universidade de Brasilia, Brasilia. ** +
US: U.S. National Herbarium, Washington. *** +
VEN: Herbario Nacional de Venezuela, Caracas. *** +
VIC: Escola Superior Agric., Vicosa, Brazil. ** +
W: Naturhistorisches Museum, Wien *** +
WIS: University of Wisconsin, Madison **
Y: Yale University, School of Forestry, New Haven *
Z: Botanische Garten und Institut fur Systematische Botanik der Universitat Zurich ** +
ZT: Institut fur Spezielle Botanik der Eidg. Technischen Hochschule, Zurich ** +

The abbreviation "Kr. Herb." stands for "Krukoff Herbarium". Specimens so designated are deposited at New York Botanical Garden.

No place of deposit is indicated when a particular collection is known only from New York Botanical Garden.

Photographs are cited only when the specimens were not seen.

Krukoff's collections are distributed to various herbaria. Their place of deposit is not indicated, as all are represented at New York Botanical Garden.

If the available material was inadequate for positive identification, the collection is preceded by an interrogation mark.

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* Specimens examined only in connection with the preparation of the monograph and the first two supplements in 1939 to 1943 (incl.) (15 herbaria).

** Specimens examined only in connection with the preparation of Supplement III in 1964 to 1968 (incl.) (25 herbaria).

*** Specimens examined in 1939/1943 and again in 1964/1968 (19 herbaria)

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